MODERN Machine Shop

A Magazine for Machine Shop Executives
HOWARD CAMPBELL, Editor

Vol. 4 SEPTEMBER, 1931 No. 4

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MODERN Machine Shop

SEPTEMBER, 1931

CINCINNATI, OHIO VOL. 4, NO. 4

Manufacturing Parts For Electric Refrigerating Units

Machining the Rotor—Some Interesting Broaching Operations—A High Production Drilling Unit

By DONALD A. CLARK

OWING to the high-duty requirements of a refrigerating pump, or compressor, all the parts—and especially the rotor—must be made with extreme accuracy and of the best material obtainable for the purpose. At the same time it is essential that production costs be kept within the bounds of reason, and the output must be ample to keep up with the demand for a commercially popular product. It is obvious that many of the manufacturing operations on parts for the electric refrigerator will be interesting, and this article will deal with a number of such operations as handled in the plant of the Majestic Household Utilities Corporation, Chicago.

Three rotors for the refrigerating pump of the "Majestic" electric refrigerator are shown in Fig. 1, in various stages of completion. The rotor indicated at **A** is as the piece comes from the automatic screw machines, where it has been turned and cut off. At **B** the rotor is shown with the vane-slots broached in, and a finished piece is shown at **C**. Details as to measurements and tolerances are given in the drawing Fig. 2. The material used is Jalcase 10-20 point carbon, hot-rolled steel (S. A. E. 1350).

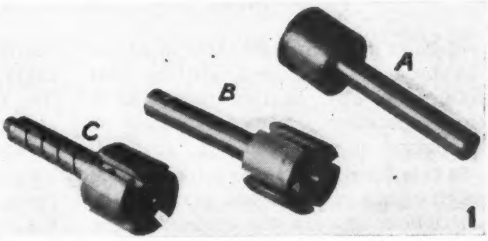


Fig. 1—Three compressor unit rotors in various stages of completion.

The first two operations on this piece are of the common or garden variety, the turning being done as stated above, and the stem being ground in a centerless grinding machine. The third operation consists of broaching the four slots, which is done with the aid of the equipment shown in Fig. 3. The machine is a special

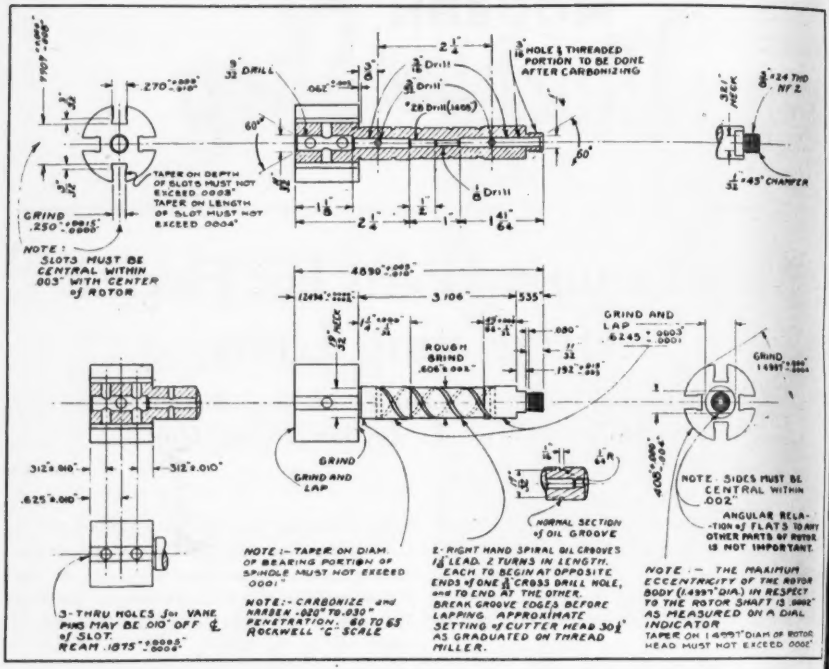
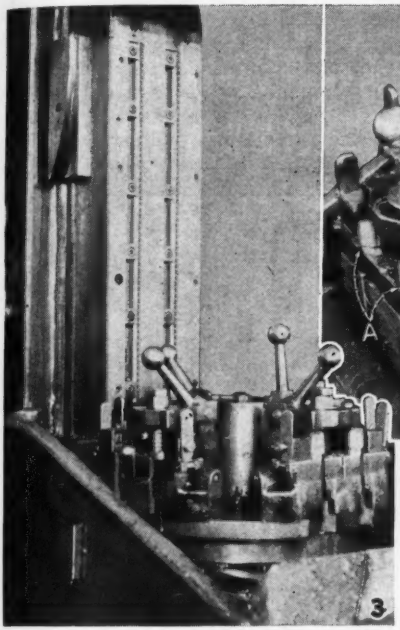

HOLE & THREADED PORTION TO BE DONE AFTER CARBONIZING
TAPER ON DEPTH OF SLOTS MUST NOT EXCEED .0003" TAPER ON LENGTH OF SLOT MUST NOT EXCEED .0004"
GRIND .250"
NOTE: SLOTS MUST BE CENTRAL WITHIN .003" WITH CENTER of ROTOR
ROUGH GRIND .606"±.003
GRIND AND LAP .6245"±.0003" .0001
GRIND
GRIND AND LAP
NORMAL SECTION of OIL GROOVE
NOTE:- SIDES MUST BE CENTRAL WITHIN .002"
ANGULAR RELATION of FLATS TO ANY OTHER PARTS OF ROTOR IS NOT IMPORTANT.
3-THRU HOLES for VANE PINS MAY BE .010" OFF ℄ of SLOT. REAM .1875"±.0003" .0004"
NOTE:- TAPER ON DIAM. OF BEARING PORTION OF SPINDLE MUST NOT EXCEED .0001"
NOTE:- CARBONIZE and HARDEN .020" TO .030" PENETRATION; 60 TO 65 ROCKWELL "C" SCALE
2-RIGHT HAND SPIRAL OIL GROOVES 1/8" LEAD. 2 TURNS IN LENGTH. EACH TO BEGIN AT OPPOSITE ENDS of ONE 1/8" CROSS DRILL HOLE, and TO END AT THE OTHER. BREAK GROOVE EDGES BEFORE LAPPING. APPROXIMATE SETTING of CUTTER HEAD 30½" AS GRADUATED ON THREAD MILLER.
NOTE:- THE MAXIMUM ECCENTRICITY OF THE ROTOR BODY (1.4997" DIA.) IN RESPECT TO THE ROTOR SHAFT IS .0002" AS MEASURED ON A DIAL INDICATOR
TAPER ON 1.4997" DIAM. OF ROTOR HEAD MUST NOT EXCEED .0002"

Fig. 2—Drawing showing dimensions of compressor unit rotor.

Foot-Burt broaching machine in which two broaches are used, cutting two slots, vertically, in two rotors at a single operation. A close-up view of the fixture is shown in Fig. 4.

In this illustration two rotors, in the rough state, are shown clamped in position at **A**. In the course of the operation, each side of the fixture, in turn, is presented to the broaches **B** with which the slots are cut. A pair of finished pieces is shown in the fixture at **C**. As the slots must be cut in correct relation to each other, the first slot cut in each rotor serves as a locating point for the next one. As the head carrying the broaches feeds downward, one slot is cut in each piece. Then the fixture is rotated to present the next two pieces, and the operation is repeated. When the side carrying the slotted pieces comes to the front, the hold-down clamp is loosened slightly and the pieces are rotated by hand so that a locating tongue can enter the first slot in each piece, thus locating them correctly for the second slot. The pieces are indexed in the same manner after each cut until four slots have been cut in each piece.

As indicated on the drawing, the slots must be central within 0.003 in. of the center of the rotor. All of the hold-down operating levers are shown in clamping position except the lever indicated at **D**, this lever being thrown back about half way. Further movement of this lever will pull the clamp **E** clear of the tops of the rotors so



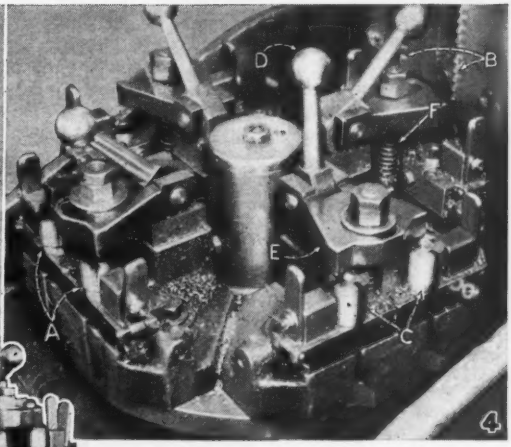


Fig. 3—Vertical broaching machine with which the slots are cut in the heads of the rotors. Fig. 4—Close-up view of the work-carrier of the broaching machine.

that they can be taken out. The spring F keeps the clamp up and free of the work when the lever is thrown back. When the clamp operating lever is pulled forward, it not only forces the clamp outward over the rotor heads, but it also brings the eccentric into play and firmly clamps the work.

Each of the broaches is made in four pieces, as shown in Fig. 5. Each broach not only cuts the slot, but also cuts side clearance at the bottom of the slot so that the possibility of any radius, however small, in the bottom corners of the slot will be avoided.

The broach is 26 in. long, with teeth spaced $\frac{7}{16}$ in. apart. The lower end of the broach is 1 in. from the back face to the front of the teeth, and the upper end is 1.380 in. The teeth are 0.234 in. wide through the body; with the added width at the front of the teeth for cutting the clearance in the bottom of the slots, the teeth are 0.270 in. wide back for a distance of 3/32 inch. The output on this operation is 110 finished pieces per hour. A broach will cut approximately 10,000 pieces before it requires regrinding.

The flats on the end of the stem of the rotor are produced by broaching in the machine shown in Fig. 6. The broaches, in this case, are set with the teeth facing, so that both flats may be cut on each stem at a single stroke

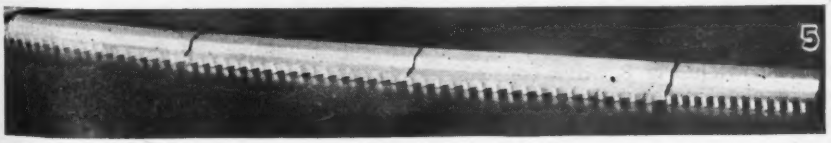
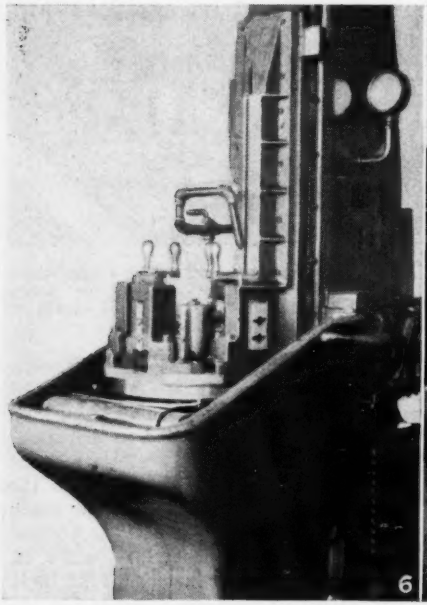


Fig. 5—One of the sectional broaches used in cutting the slots.

of the broach. Also, two stems are broached at each stroke, which is made possible by the use of a fixture that holds two pieces in each of the four sides—one piece above the other, as shown at **A** in Fig. 7. The pieces are placed in the jaws from the inside. The two pieces indicated at **B** are in broaching position, the ends of the stems projecting outward, toward the broaches. The carrier in which these two pieces are held in on the opposite side of the fixture. The production on this operation is 500 pieces per hour, and a broach will finish 50,000 pieces or more before grinding is necessary.

Cross drilling and reaming of the rotor heads is done in machines of the type shown in Fig. 8, which consists of a complete motor-operated unit built by the Krueger Division of the Ex-Cell-O Aircraft & Tool Corporation. In placing the rotor in the fixture, the head of the piece is turned away from the operator and is located with the ends of the broached slots fitting over corresponding projections on the boss **A**. The handle on the lever **B** is pulled at the same time, pulling outward a counterbored and slotted locking slide to provide clearance for inserting the piece. When the lever is released, the piece is firmly locked in position. There are nine operating stations in addition to the loading station, and as the work carrier indexes from one station to the next, three 0.1875 in. holes are drilled through the head with two holes in the two opposite slots and one hole in the other pair of slots as shown in the drawing, the same holes are reamed, and two 3/32 in. holes are drilled in the stem. The fixture holds ten pieces and indexes four times in



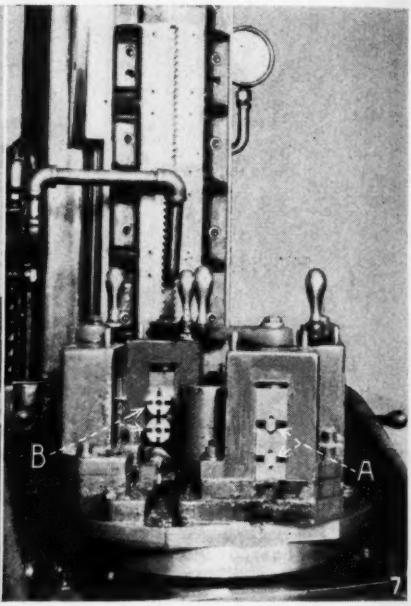


Fig. 6—Machine used to broach driving flats on the ends of the rotor stems. Fig. 7—Close-up view of the work carrier on the stem-broaching machine.

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—Ortleb Corp., 2513 Baldwin Street, St. Louis

"... and it is very accurate, fast and easy to handle," says Mr. Douglas Ortleb in his letter to us of March 24, 1930.

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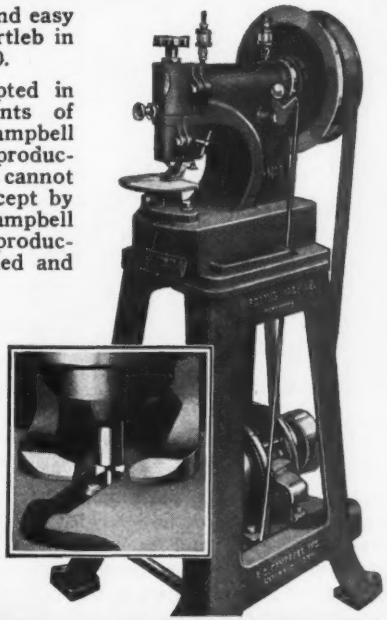

How the Campbell Nibbling Machine Operates

The "close-up" shown at the right illustrates how the Campbell Nibbling Machine "nibbles" a narrow lane—leaving a comparatively smooth edge. Internal or external designs can be cut 40 to 60 times as fast as drilling.

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Name of Company.....M.M.S. 9-31

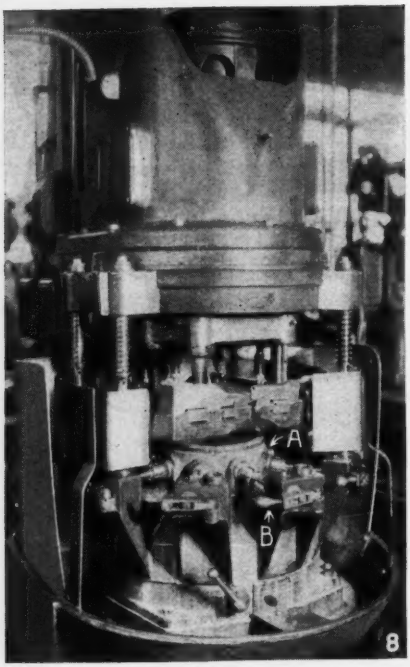

Fig. 8—Krueger unit used in drilling and reaming the 0.1875 in. holes for the vanes and drilling the 3/32 in. holes in the stems.

the course of indexing the ten positions. The function of the operator is confined to inserting and removing the rotors from the fixture. The average production on this machine is 140 finished pieces per hour.

(The second and concluding article on this subject will be published in the October issue.)

Specialized Vocational Training

VOCATIONAL education for trade and industrial pursuits will eventually be carried out on a part-time "co-operative" basis, the learner spending part of his time as an employee in the occupation and part in the class-room, according to a prediction made recently by Perry M. Reeves, labor representative on the Federal Board for Vocational Education. Speaking at a conference of leaders of vocational education from the Pacific States at Boise, Idaho, Mr. Reeves predicted further that future vocational education courses would be made up of short unit courses, each unit including training for some portion of an occupation.

"For instance," Mr. Reeves said, "a course in the carpentry trade might very well be divided into short unit courses covering such items as form-making, framing, shingling or siding, fitting trim, installing doors and windows, and similar items. Whether the prospective carpenter drops out of a course of this kind before he has completed all the units or finished the course in full, he will still have a knowledge and skill in one or more specialized branches of an occupation he can sell."

As Mr. Reeves visions the faculty of the vocational trade and industrial school of the future, it will be drawn from the ranks of the workers and its personnel will be continually changing as conditions demand.

"Finally," he told his audience, "I venture to prophesy that instead of being housed in expensive buildings filled with machinery, vocational schools will carry on their work all over the community so as to be readily accessible to workers and prospective workers; that they will utilize all of the facilities of the occupations represented in industries in their immediate communities, and that they will be so tied up with the life of the community that they will be able to secure expert teaching service as needed and to continually keep themselves up-to-date with changing conditions."

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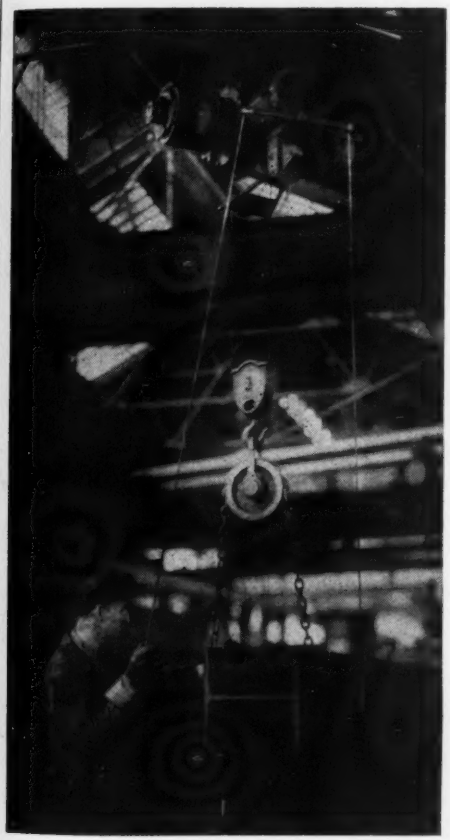
PROFITABLE LOAD HANDLING



INDUSTRY'S predominating choice of Shepard Electric Hoists is not casual. It is the result of experience which has proven conclusively that these hoists do make for the maximum economy in load handling.

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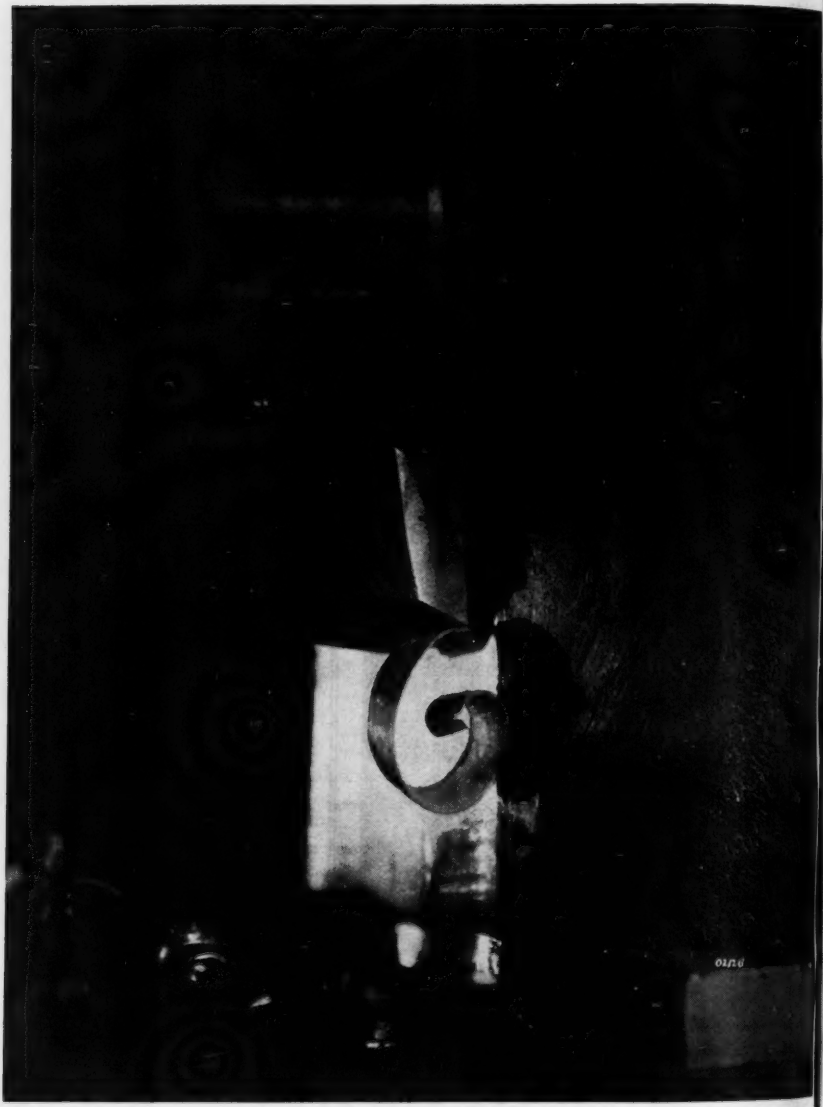

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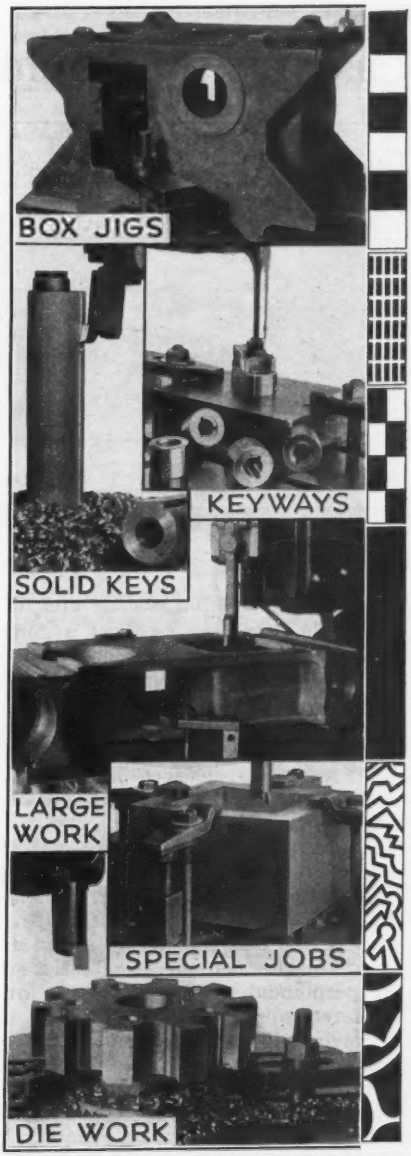
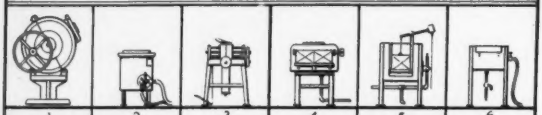


BY PRATT & WHITNEY

Casting Aluminum and Copper Alloys By the Permanent Mold Method

By JOSEPH PIGNONE
Technical Director,
J. J. Berliner & Staff

Process Table of the
PERMANENT MOLD METHOD OF CASTING ALLOYS



1	2	3	4	5	6
For CASTING			For TREATING		
MELTING FURNACE	HOLDING FURNACE	CASTING MACHINE	STRAIN OVEN	HEATING FURNACE	QUENCH BATH
Temperatures					
UP TO 2500°F	POURING TEMP. ALLOY	BELOW 2000°F	280°F	920 TO 980°F	HOT WATER OIL & STEAM
Time of operations					
UNTIL MELTED	UNTIL NEEDED	UNTIL CHILLED	UNTIL OVEN & METAL COOL	½ TO 12 HRS	15 MIN
Time betw. operations	MINIMUM			ABSOLUTE MINIMUM	

JP

THE subject of die casting and its application has received a considerable amount of attention recently, and those far-seeing manufacturers who have contributed of their time and resources to the development of this process have been generously rewarded. The distinct advantages offered in the casting of duplicate small parts in quantity have induced them to attempt a similar method in the handling of the harder alloys. By considering first the economies resulting of die casting as a manufacturing process, and then the decided superiority of the product, the possibilities of the permanent mold process are immediately apparent.

Previous to the widespread application of the metal mold processes, quantity duplication of small castings was a cumbersome problem, indeed. Intricate and ingenious machines were evolved and experimented with, but so long as they served only to speed the making of sand molds and the time required to pour into them, the problem remained unsolved. Aside from their general inefficiencies, such machines were incapable of overcoming the failures and faults peculiar to all small castings formed in sand.

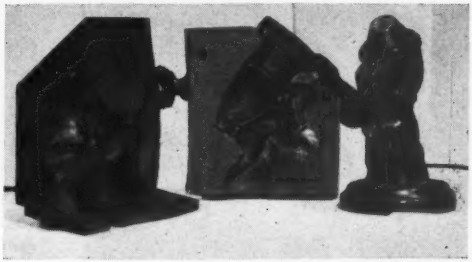
Experimentation with the metal mold, which, in conjunction with high pressure pouring really functioned as a die, disclosed that castings formed in this manner were not only improved in appearance, but also in physical structure. The castings were more accurate in size and shape, required far less machining and surfacing, and could be produced at a high rate of speed, all of which combined to reduce costs radically. A better grade of casting was produced, a higher density of mass being obtained due to the fact that the casting, during the shrinking process, drew from feeders rather than from the casting itself. In addition, the semi-steel molds or dies chilled the metal

to solidification so rapidly that a finer grain structure resulted.

Despite the gratifying development of every phase of the die casting process, however, certain definite limitations are still identified with its practicability. It is to be remembered that the use of this process is hardly feasible when dealing with alloys whose melting points approach 1500 deg. F. Under the extraordinary pressures used to force the molten metal, extremely rapid deterioration of the dies results when this point is touched.

The development, then, of some method or system whereby the advantages of die casting should be maintained, while handling alloys with higher melting points, was inevitable. The method known as the permanent mold method is the outcome, but the method has not as yet been extensively exploited, nor has it even received a fair measure of discussion. In fact, the firms using this method today in commercial production work are comparatively few. However, those who have pioneered the development of the process report so well in its favor that a short discussion of the permanent mold method is quite warranted.

First of all, no pressure is used in casting by this method; the metal is simply poured by gravity as in sand casting, which enables the cast steel mold to be exposed to much higher temperatures at atmospheric pressure. Pourings of aluminum and copper alloys, some of the latter of which attain temperatures of 2,000 deg. F., result in castings of the same precision and internal structure as do other alloys in die casting.



Metal mold used to cast aluminum alloy ornament. The mold consists of four sections and core piece through which the metal is poured. The casting is shown at the right.

As in die casting, machines are used to hold and operate the molds. Automatic as they are, even to the withdrawing of the cores, considerable refinement is yet possible in their construction and operation. No doubt as the application of the permanent mold method becomes more general, these machines will attain a perfection comparable to that of the machines used in die casting. It is only the attention and study required to perfect other phases of this new

(Left) A part of the impression can be seen in the largest one of these three mold sections. (Right)—Here the three parts are shown together, ready to be combined with the fourth part to make a complete mold.

method, such as temperature control and methods of pouring, that hinders the development of more complete casting methods and equipment.

The molds themselves are of semi-steel, and are highly finished internally. Sometimes sand cores are used in conjunction with permanent molds.

Drawing the molten metal from a large "Monarch" oscillating gas furnace.

The component parts of the mold are forced together and clamped by the machine during pouring, and are opened to permit the chilled castings to drop out.

At the present time, the most vital link in the process is the intermediate or holding furnace. The object of the holding furnace is primarily to maintain the temperature of the molten metal not only constant, but also at the lowest temperature at which the particular alloy will pour efficiently, consequently the importance of this equipment is directly attributable to the close temperature control so necessary in dealing with special-purpose alloys, particularly those of aluminum base.

When pouring, the higher the temperature of the metal, the slower is the rate of freezing and the larger the size of the crystals, causing a progressive decline in the physical characteristics of the resulting casting. If the temperature is too high, burning takes place, especially with aluminum alloys. Hence, pouring temperatures are narrowed down to the lower limit of the melting range—which calls for unusually close temperature control.

The furnace is of the regular vertical type, wherein the flame is caused to swirl around the crucible. It is comprised of a steel casing suitably lined with refractory brick, inside of which a 500-pound crucible is placed. A gas burner pierces the casing near the bottom and fires tangentially along the surface of the furnace lining instead of against the crucible. Correct pouring temperature is maintained for each respective alloy by incorporating a pyrometer and positive automatic control of the fuel supply within each furnace unit.

In practice, several holding furnaces are grouped together, and the molding machines are wheeled within reach of them. They are loaded by chain hoists which carry the charge crucibles from the melting furnaces, located some distance away. This arrangement provides for greater ease of supervision.

The melting furnace best suited thus far to the specialized requirements of this process is of the rocking or oscillating type, directly fired by gas. It consists of a cylindrical casing resting horizontally on rollers which, in turn, are journaled in massive cast iron support frames. The steel cylinder is lined with refractory material and is split lengthwise to facilitate renewal. One end of the cylinder is riveted to

Here the casting machines are arranged in a circle around the holding furnaces.

a cast iron head through the center of which the burner is mounted. This head also carries a large gear which is meshed with the worm of a motor drive. An oscillating motion may be imparted to the whole unit over the rollers by this method, and it may be tilted farther, for pouring out its charge, by means of a large hand wheel.

A hinged cast iron door, properly lined and supplied with a vent hole, is clamped down over a steel collar surrounding the pouring opening in the furnace. When in operation, the cylinder is rotated until the charge almost touches this door, then it is turned almost 180 degrees in the opposite direction. The unit remains stationary for 15 minutes while at each end of the tilting arc; consequently a charge of 2,000 pounds of metal is melted in a comparatively short time.

Gas-fired furnaces are also used for annealing or heat treating the castings to impart characteristics to the metal, and render them particularly suited to specialized purposes. For removing casting strains, parts are heated in an oven to 280 deg. F. and are then allowed to cool slowly with the oven. The heat treatment of these castings consists of heating them to the required temperatures and quenching in boiling water, cold water, or oil, and ageing in air. The temperatures used vary from 920 to 980 deg. F., depending directly upon the chemical composition of the alloy used in the casting.

When quenched, the material is almost as soft as when it is in the annealed state, but it increases in hardness and strength (tensile and yield point) when allowed to stand at room temperature. This ageing action is rapid at first, but it decreases, to gradually terminate in from four to ten days, resulting in little or no loss in elongation properties. However, a decided decrease in plasticity occurs in the ageing action. Some alloys require a second heating and quenching in order to achieve maximum effects, while others age spontaneously at room temperature. Hot air blast or steam is sometimes resorted to in this second quenching.

After the metal has been raised to the correct temperature for heat treating (920 to 980 deg. F.), it must be continued in "soaking" for time periods varying up to 12 hours, before quenching. Cross section of the

casting, chemical composition of the alloy, and physical characteristics required directly determine the time interval involved. Here again precisional temperature control is essential, for if the heat is too low the effects desired will not be obtained and if too high partial melting and burning coupled with a loss in strength and ductility will follow. It is also necessary to reduce the time period between furnace and quenching medium to an absolute minimum, as the initial rate of temperature decline must be as rapid as possible.

Metal is taken from the holding furnaces to be poured into the molds. Casting machine in the foreground.

Final cleaning is accomplished in a washing machine consisting primarily of a rectangular steel casing equipped with a wire mesh traveling conveyor. A series of needle spray nozzles through which hot washing solutions are forced are located in one end of this machine, while a row of gas burners transforms the other end into a drying oven.

Some of the alloys produced by a Detroit cast products concern,* which has developed this permanent mold method to a surprising degree, reveal unusual physical properties. Castings with almost any combination of characteristics are made at this plant from the various alloys used, most of which are based with aluminum. For instance, aluminum alloyed with small percentages of copper, silicon, iron, magnesium, and tin, any or all, will produce castings of tensile strengths ranging from 18,000 to 30,000 pounds per square inch and with elongation percentages in 2 inches reaching as high as 10 per cent. When heat treated, tensile strength of the same alloys is increased enormously, running between 24,000 and 55,000 pounds per square inch.

One of the most commonly used alloys is one containing 92 per cent of aluminum and 8 per cent of copper which, when poured, develops a tensile strength of 18,000 to 20,000 pounds, a yield point of approximately 16,000 pounds, and an elongation of from 2 to 3 per cent.

Another alloy contains 95 per cent of aluminum and 5 per cent of silicon with a resulting tensile strength of 24,000 pounds, a yield point of from 17,000 to 18,000 pounds, and an elongation of 4 to 5 per cent. Still another —one of the toughest—consists of aluminum with nickel and magnesium or manganese. Castings made from this, when heat treated, develop tensile strengths ranging from 35,000 to 40,000 pounds.

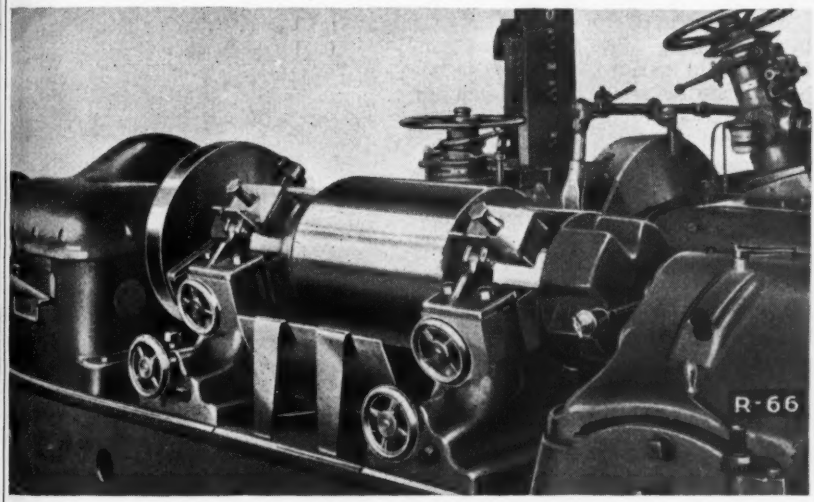
The particular firm previously mentioned recently re-equipped its plant with gas-fired melting furnaces. It

*Monarch Aluminum Ware Company, Detroit, Mich.

736 TIN PLATE ROLLS GROUND ON A LANDIS during the life of one wheel

A typical steel mill operation is the grinding of tinplate rolls. Because of the number of rolls which a mill of considerable size uses, this operation must be performed with the utmost economy.

One mill which has been using two Landis 30"x96" Roll Grinders for several years has just reported as many as 736 rolls being ground during the life of a single wheel. Stock removal was .030" to .035". Amount of concavity was .022".



True enough, such a result is a compliment to the wheel makers art. But it is just as true that only a grinding machine designed and built with the utmost care could bring about such sterling wheel performance.

Regardless of the type of rolls you grind economy demands that you investigate the Landis. As a final thought, it is suggested that the matter of contours be considered carefully. Remember that they must be symmetrical either side of the center of the roll. They—if concave—must take the shape of a straight edge cross. When ground on the Landis they will fulfill all of these requirements.

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found that a saving of 30 per cent was effected when the oil burner melting furnaces were discarded in favor of gas. It may be found later, however, as the daily demand for molten metal increases, that a further substitution may be made with greater advantage.

While the gas-fired furnace yields this saving, because of a closer temperature control than is possible with oil, it must be remembered that it is direct-fired. Due to the large area of metal surface which is directly exposed to the application of heat, metal losses are high.

The greatest advance made thus far in the melting of alloys in the nonferrous field, particularly of brass, has been made by applying the induction furnace to this purpose. Brass can be melted in this type of furnace more cheaply than in any other type. However, this low cost can be obtained only if the furnace is operated under certain favorable conditions, which are:

1. Furnace must operate continuously (24 hours).
2. Molten metal must remain in the furnace from heat to heat.
3. Electric power must be available for .015 cents per kilowatt hour or less.
4. Production must be at least 2,000 pounds per hour.

Of course, the conditions outlined rather limit this furnace type in its application to this process in its present stage of development. Still, as the demand for quantity-produced aluminum and copper alloy castings of high quality increases, its adoption may be widespread for the permanent mold method of casting up to 2000 degrees Fahrenheit.

Electrical Conductivity of Metals and Alloys

Conductivity of different metals depends upon temperature, which means that the conductivity of copper, for example, at 32° Fahrenheit, is 100; at boiling point, 212° temperature, conductivity has dropped to 70.

Lazare Weller's Table

Which Is Based on Conductivity of Metals at 32° Fahrenheit

Pure silver	100
Pure copper	100
Telegraphic silicious bronze	98
Alloy of ½ copper, ½ silver	86.65
Pure gold	78
Silicide of copper, 4 per cent Si	75
Telephonic silicious bronze	35
Pure zinc	29.9
Brass with 35 per cent of zinc	21.5
Phosphor tin	17.7
Alloy of ½ gold, ½ silver	16.12
Swedish iron	16
Pure Banca tin	15.45
Aluminum bronze (10 per cent)	12.6
Siemens steel	12
Pure platinum	10.6
Copper with 10 per cent of nickel	10.6
Pure lead	8.88
Bronze with 20 per cent of tin	8.4
Pure nickel	7.89
Phosphor-bronze, 10 per cent tin	6.5
Antimony	3.88

Swiss Jig Borer Catalog No. 534

Catalog No. 534 of the Societe Genevoise d' Instruments de Physique, of Geneva, Switzerland, for whom The R. Y. Ferner Company, Investment Bldg., Washington, D. C., is the American agent, describes the latest model of their Type MP-3C SIP Precision Borer for the locating, drilling, boring and checking of workpieces. It shows several new features of these machines, which have been added since the first of this type was exhibited at the Power Show last December, including drive by motor mounted vertically on the side of the machine, increased height below the cross rail, and a greater range of boring and drilling speeds. This machine has capacity for boring pieces 12 x 18 in. at one setting. The catalog illustrates various accessories and shows typical jobs done on the Swiss Jig Borers, with figures of the time saved and the accuracy obtained.

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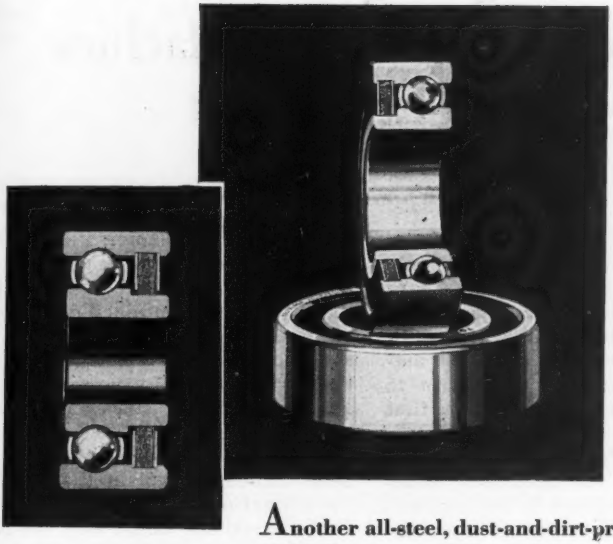

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Acts Obligating Purchaser To Accept and Pay For Machine Shop Equipment

By LEO T. PARKER
Attorney-at-Law, Cincinnati, Ohio

FREQUENTLY purchasers who desire to rescind a contract of sale present unique excuses to justify cancellation of an order or rejection of the shipment. One common source of controversy is where a buyer of machine shop equipment endeavors to cancel a contract and contends that he was not fully informed of the contents of the contract when he signed it. However, it has been well established that a contract is not rescindable, although it is proved that the complaining party was mistaken with respect to the obligations, unless convincing evidence is introduced showing that cancellation of the contract is mutually agreeable to both parties. An illustration of this phase of the law is found in the late case of Dixon vs. Morgan, 285 S. W. 558.

In this case it was shown that a purchaser signed a contract of sale without taking the necessary caution to carefully read it. This court explained that the general principle of the law, which runs through nearly all of the cases of this character, is that a contract made through mistake of one party will be cancelled *only* when it can be done without doing injustice to either person. Moreover, this rule is applicable although the purchaser testifies that he was deceived by the seller or his agent.

For instance, in a recent case (298 S. W. 918) it was shown that a purchaser negligently signed a contract of sale without reading it. Later he refused to accept the machine on the contention that he had discovered that the instrument contained certain stipulations that were not called to his attention by the seller when the contract was made. In the resulting litigation the buyer contended that he was mistaken of his obligations, and that he was deceived because the seller failed to explain the details of the obligations. Notwithstanding these contentions, the Court held the buyer required to fulfill the contract, and said:

"In the absence of fraud, misrepresentation, or concealment, the rule is well established that one who can read and who signs a contract without reading it, and under circumstances which do not preclude an exercise of due diligence upon his part to ascertain the contents of the contract, will not be heard afterward to say that he did not read it and did not understand its provisions."

Another common excuse of buyers who desire a reason for avoiding obligations assumed under a contract of sale is that the seller's salesman misrepresented the merchandise. It is important to know that a salesman's sole *implied* legal authority is to accept orders and send them to his employer for approval, and if the latter is not satisfied with the offer submitted, he may reject the proposal or simply refuse to deliver the goods.

And conversely the buyer *always* is privileged to send his cancellation of the order at any time before the salesman's employer acknowledges the same.

In other words, the law is established that a salesman is merely a special agent, whose implied authority extends no further than to solicit the buyer's orders or proposals to purchase merchandise. Therefore, if the seller desires, he may without liability reject the orders sent in by the salesman, providing the rejection is made promptly upon receipt of the order. Moreover, this is true although both the buyer and the salesman signed the order intending to complete a valid contract of sale.

And, also, verbal promises made by a salesman have little or no legal effect of increasing the liability of his employer. This is true irrespective whether the order blank contains a printed notification warning the purchaser that the seller is not responsible for verbal statements made by the salesman.

For example, in Portland Co. vs. Whitmore Co., 150 S E., it was disclosed that a salesman approached a prospective purchaser and obtained an order upon which was printed the following: "Orders are not binding on this company unless accepted by the general office." Later the purchaser refused to accept the shipment on the contention that the salesman had made verbal promises which the seller failed to fulfill. The seller sued the purchaser and the lower Court held the latter not liable, but it is important to know that the higher Court reversed the verdict, stating the following important law:

"The defendant company (purchaser) had notice from the order blank itself that the agent did not have authority to contract, but only to accept orders. But, *even had he had such authority,* the fact that the defendant (purchaser) has signed the written order, the law presumes that all preliminary negotiations were included and merged in the writing, if it purports to contain all of the contract, and parol evidence cannot be introduced to vary its terms. The order in the present case was clear on its face and contained no notation suggesting any other understanding than that contained therein."

Frequently purchasers of machinery or machine shop supplies perform acts by which they are compelled to pay for the equipment, although the same is unsatisfactory and does not equal the quality specified in the contract of sale. In other words, any act performed by a purchaser, without consent of the seller, which does not effect prompt rejection of merchandise and its return to the seller, is a legal and valid acceptance.

This is true because the law is well settled that it is the legal duty of a buyer to immediately inspect delivered goods. If defects are apparent and he retains the equipment, after discovering the imperfections, without notifying the seller, he cannot defend a suit by the seller for the purchase price on the contention that the merchandise is not as represented.

For illustration, in the recent case of Nolle vs. Baida, 254 Pac. 623, it was shown that a purchaser contracted to buy a quantity of merchandise. Five or six months passed before the buyer inspected the goods and found them to be defective. Thereupon, the purchaser immediately communicated with the seller, who promised to take back the merchandise and refund the purchase price. However, the seller failed to fulfill his promise and the purchaser filed suit. It is interesting to observe that the Court held that the purchaser had legally accepted the

merchandise, because he had delayed in filing his complaint.

In other cases, the higher courts have held that a delay of two or three months on the part of a purchaser in notifying a seller of defects in the equipment sold is legal acceptance of the merchandise, providing such defects are readily apparent.

Another well settled point of the law is that appropriation by the purchaser of merchandise is a valid acceptance, resulting in the buyer being liable for payment of the full contract price, although controversy had developed between the buyer and seller before the appropriation regarding the value or quality of the goods. Moreover, the same law is applicable where a purchaser who accepts merchandise is unable to account for it.

For instance, in Administration vs. Raquemore, 117 So. 757, it was shown that a purchaser objected to accepting purchased merchandise because it did not equal the samples submitted when the contract of sale was signed. However, the seller insisted that the purchaser accept delivery, and the latter finally consented to permit the goods to be left in his warehouse with the direct understanding that he intended to return the shipment. The merchandise disappeared and the purchaser refused to pay the account on the contention that he had explained to the seller when delivery was made that he was not satisfied with the quality of the goods.

It is interesting to observe that the Court held the seller entitled to recover the full purchase price, saying: "It is true that where goods are expressly rejected, their mere deposition on the buyer's premises, even with his consent, will not in itself create an acceptance, nor become an effective delivery. . . Receipt does not necessarily mean acceptance. . . And, while a mere receipt of goods is not in itself an acceptance of them, it may be, under favorable conditions."

In view of these established points of the law it is readily apparent that a purchaser who accepts a shipment and pays a C. O. D. charge cannot subsequently rescind the contract and recover the money paid on the C. O. D. charge. An example of this phase of the law is found in Mutual vs. Hori, 259 Pac. 712. In this case it was disclosed that a purchaser ordered certain equipment shipped with a sight draft attached to the bill of lading. When the merchandise arrived, the purchaser wired the seller that the amount of the draft was too much and requested him to correct the same. The seller answered stating that the amount of the draft was correct. Since the purchaser required the goods he paid the draft and then filed suit against the seller to collect the difference between the price paid and the actual value of the merchandise.

However, the Court held the buyer not entitled to a recovery, because his act of paying the draft constituted legal acceptance of the goods, saying: "The general rule is that one person cannot make himself the creditor of another by voluntarily paying a demand of that other which he is under no obligation to pay. . . The payment was made with full knowledge of all of the circumstances. . . Having paid the price and having taken possession of the goods and converted them to its own use, it (buyer) is now estopped from asserting that there was an overpayment of the purchase price."

Still another well established phase of the law is that any act on the part of a buyer which alters the legal relation of the parties without the seller's consent is deemed a valid acceptance. In the late case of Huber vs. Lalley, 218 N. W. 793, it was proved that a buyer, instead of promptly returning unsatisfactory equipment, gave his

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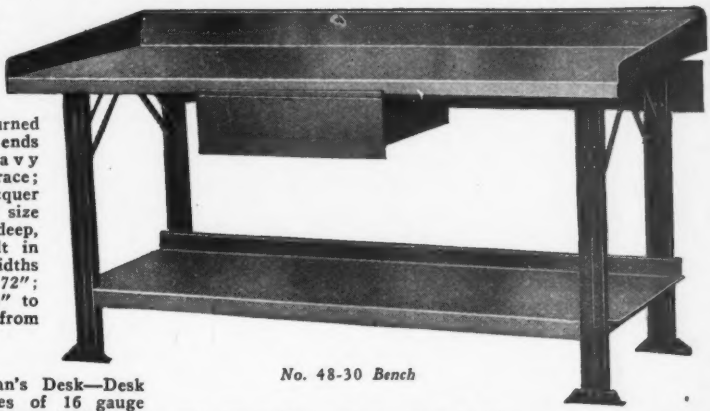

No. 48-30 Bench

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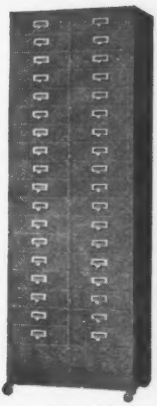

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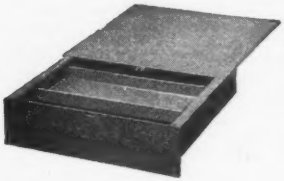

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permission to a creditor, without knowledge of the seller, to hold the merchandise as security for a debt. The buyer refused to pay the account and the seller filed suit. The Court promptly held the seller entitled to recover the full purchase price, because the purchaser had temporarily given up possession of the goods.

Also, in the leading case of Fillmore vs. Garvan, Inc., 97 Conn. 207, it was shown that a buyer refused to pay for defective equipment, stating that he would hold it in his warehouse until the seller furnished other equipment of the quality specified in the contract. The Court held that such an attempt to establish a lien on the defective merchandise results in legal acceptance. Therefore, it is quite apparent that any act on the part of a purchaser which results in unreasonable delay in returning unsatisfactory merchandise to the seller is legal acceptance.

Moreover, it is important to know that the return by the purchaser of a portion of unsatisfactory merchandise does not relieve him from liability to pay the full account. In other words, where a buyer retains a portion of a shipment of machine shop equipment and returns the balance to the seller, the former is bound to pay for the entire lot, although he may have had a legal right to reject the complete shipment.

For example, in a recent case (118 N. E. 436) a purchaser alleged that a seller breached a contract of sale by failure to ship merchandise equal to the quality stipulated in the contract. When the purchaser received the shipment he did not refuse to accept it but selected a portion of the merchandise and reshipped the balance, explaining to the seller that he would pay for the goods he had accepted and would not pay for the balance. The Court promptly held the buyer liable for payment of the *complete* shipment, saying: "The purchaser was required to reject all in order to effect a rescission. He could not accept a part and reject a part without making himself liable for the entire lot."

Also, the fact that a purchaser induces the seller to accept redelivery of returned goods does not relieve the former from liability to pay for the same, unless the seller agrees to do so when the goods are returned. For illustration, in Jackson vs. Miles F. Bixler Company, 127 So. 270, it was disclosed that a purchaser ordered merchandise under a regular written order. The goods were shipped in due time. Shortly afterwards the purchaser shipped the goods back to the seller. No notice was given the seller that the goods were being returned.

The seller sued to recover the purchase price and the purchaser attempted to avoid liability on the grounds that the seller had possession of the goods. However, the Court promptly held the purchaser liable, saying: "The authorities seem to be in substantial agreement on the general rule that, where a contract for the sale of goods has been fully performed by the seller, has been so completely executed that the title has fully passed to the buyer, the seller is entitled to recover the purchase price under his contract, although, because of the wrongful refusal of the buyer to accept the goods, they may be still in the physical possession of the seller . . . The title to the goods had fully passed to appellant (purchaser) and when he returned them to appellee (seller), there being no notice of it and no sort of excuse therefore, the return was as if to an entire stranger to the transaction."

Frequently purchasers endeavor to justify refusal to accept and pay for machine shop equipment on the grounds that the seller delayed an unreasonable time in making delivery.

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While it is true that a seller who fails to make delivery on a promised date breaches the contract and forfeits his rights thereunder, yet the law implies that a purchaser consents to an extension of the time for delivery when he authorizes the seller to change the specifications of equipment being specially manufactured.

For instance, in Parish Mfg. vs. Martin Corporation, 143 At1. 103, it was disclosed that on December 17th a manufacturer entered into a contract with a purchaser by the terms of which the former agreed to make delivery not later than March. Several weeks after the order was signed, the buyer notified the manufacturer that certain changes were required in the construction of the machine. By reason of these changes, it was not until May that delivery of any of the machines could be made.

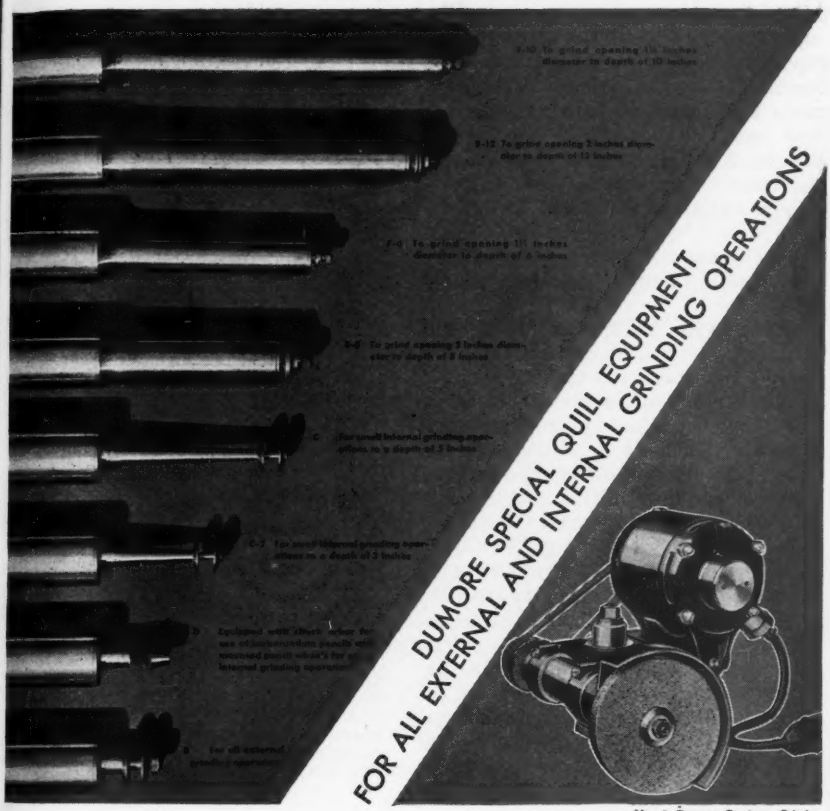
The buyer refused to accept delivery because of the lapse of time after the date of delivery specified in the contract. The seller brought suit against the buyer to recover damages resulting from the refusal of the latter to accept the shipment. The lower Court held the seller not entitled to a recovery, but it is interesting to observe that the higher Court reversed this decision, saying: "Under the contract the buyer had the right to insist upon the shipping of the goods within the time fixed. Had he done nothing to waive this obligation, and if there was a default by the seller in forwarding, no recovery of the purchase price could have been had, though a tender was later made and the buyer had given no notice of cancellation."

On the other hand, it is important to know that a seller is bound to make agreed alterations within a reasonable time. Otherwise he is liable in damages for breach of the contract to the same extent as if he should fail to make delivery within the time stipulated in the original contract. Just what duration of time may be held to be a reasonable time depends upon the circumstances surrounding the case. Generally, a jury decides this question after being fully informed by relevant testimony which tends to conclusively indicate whether the seller acted as other prudent and fair-minded men would have acted under the identical circumstances.

Another important point of the law is that although a seller is technically liable for failure to make prompt delivery of purchased merchandise, the buyer cannot avoid liability after refusing to accept and pay for the goods, if his refusal is based on an illegitimate excuse or he delays an unreasonable time before complaining of delayed delivery.

For example, in Schulze Co. vs. W. H. Goodson, 119 So. 353, it was disclosed that on June 27th a salesman for a manufacturer obtained a written $600 order from a purchaser. On June 30th the manufacturer wrote to the purchaser and acknowledged receipt of his order and stated that the material would be shipped as soon as possible. Almost all of the material was delivered by the manufacturer to a common carrier for transportation before July 9th. On July 10th the buyer requested the manufacturer not to ship any more equipment, explaining that he had sold his business. The manufacturer replied that it was too late to cancel the contract and suggested that maybe the purchasers of the business would be able to use the merchandise.

After considerable correspondence, the purchaser refused to accept delivery and the manufacturer brought suit to recover the contract price. The buyer attempted to avoid liability upon the contention that the contract was void because the shipment was



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unreasonably delayed. It is interesting to observe that the Court held the buyer liable for the full purchase price, saying: "The effort he (purchaser) made to be released from his contract was based . . . solely on the ground that he could not use the material, for the reason that he had sold the business in which the material was to have been used. . . . The appellee (purchaser) cannot now complain of any delay in the delivering of the material."

Contrary to the opinion of the majority of persons, any person who induces a purchaser to cancel a contract of sale or influences him to reject a shipment of machines or machine shop equipment is liable in damages to the seller. To illustrate the far-reaching effect of the law on this subject, it is interesting to know that in a leading case, Herman vs. Wilburn, 66 N. Y. 82, a higher Court held a person liable in damages who induced another to breach a contract of sale, although the contract was unenforceable by the state laws. In this case it was disclosed that a buyer and seller, not being familiar with the law of contracts, unintentionally entered into an *invalid* contract for the sale of a large quantity of equipment. However, both parties intended to fulfill the terms of the contract, although neither was legally bound to do so.

A person named Manley induced one of the contracting parties to breach the contract. The other party to the contract filed suit against Manley, who attempted to avoid liability on the contention that the contract was unenforceable by the state laws. Notwithstanding this argument, the Court held Manley liable in damages and explained that any person is liable who induces a party to breach a contract *intended* to be performed by the contracting parties, although such contract actually is unenforceable by law. Obviously, therefore, a seller may sue and recover damages from either the purchaser who fails to accept ordered equipment, or the person who induced the purchaser to breach the contract.

Horsburgh & Scott Speed Reducer Catalog

The Horsburgh & Scott Company, 5110 Hamilton Avenue, Cleveland, Ohio, has published a catalog in which the speed reducers made by this firm are described and illustrated in detail. A brief review is given of the engineering principles involved in the design and selection of speed reducers, and a selection chart is included which gives the number of types of reducers which may be used for any given ratio. This chart also serves as an index to the book. Examples are given for use in selecting the correct speed reducer.

The eight types of Horsburgh & Scott Worm Gear Speed Reducers are described in detail, and horsepower ratings, dimension blueprints, and bedplate dimension prints are included. The torque in inch-pounds is given in each case, also the allowable overhung loads on the low speed shaft extensions. The three types of Horsburgh & Scott Herringbone Speed Reducers are also described in detail, together with horsepower ratings and overhung loads. The "Heli-Spur" Speed Reducer made by this firm is also described.

A copy of the catalog may be had by addressing this firm.

Chard Lathe Catalog

The complete line of Chard Lathes, which are now being manufactured by the Western Machine Tool Works, Holland, Michigan, is described and illustrated in Catalog 100, which has been issued by this firm. The catalog contains thirty-six 8½ x 11-in. pages. Each size and type of lathe is described and illustrated, and illustrations are included showing the various sections of the mechanism of the machines. All Chard lathes are now equipped with Timken roller bearings, and can be furnished with build-in motor, either Texrope drive or silent chain, and four-change ball-bearing-equipped speed box. A copy of this catalog can be had without charge by addressing the company as above.

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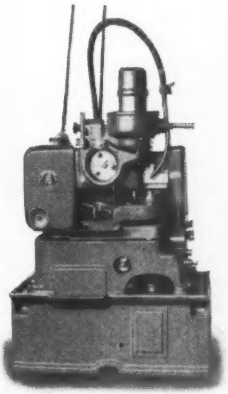

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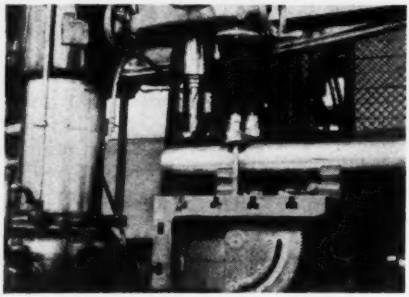
Methods of Fitting Locomotive Piston Rod Keys

By H. W. STOWELL

CONSIDERING that the task of cutting a slot for the key in the end of a piston rod and fitting the key to the rod is a job that is performed a dozen times or more each month in every good-sized back shop, it is surprising that the best and quickest method of doing this job has not been generally adopted. Often the method in use is the one hardest way to get the job done. During the writer's apprentice days, he learned to do this job by the following method.



Drilling holes for a piston key slot.

The new rod was driven back in the crosshead and the keyway was scribed, then the rod was pulled out and the holes for drilling were laid out on both sides, making the necessary allowance for draw. The rod was then taken to the drill press and drilled half way through from the opposite side to avoid possible errors in setting up. After this, the metal left between the holes was chipped out, and lastly, the necessary taper was given the slot by hand filing.

The method described below, which is a great improvement over that described above, is in use in a number of the larger shops. The keyway is scribed on both sides and holes are laid out on one side only, making an allowance of $\frac{3}{8}$ in. for draw, which is the usual amount. The amount that the table must be set over is easily determined by the use of a combination square against the column of the drill press and resting on the table as the table is adjusted. An accurate set-up can be obtained by using a square and measuring to the center line of the keyway on both sides (top and bottom) of the rod, and then it is possible to drill the holes through the rod at one setting, thus avoiding having to turn the rod over and drill again. The end of the keyway toward the piston head clears the key by about $\frac{1}{2}$ in. when the key is in place, so the slight back taper of the slot makes no difference here.

After the holes have been drilled, the metal between the holes is cut out with an end mill, fitted into the spindle of the drill press, and fed back and forth by hand. It is also possible to cut out this metal with a rose bit, feeding carefully by hand. This bit of detail gives the job a finished appearance, as though it had been done on a milling machine. The sharp edges of the keyway are filleted $\frac{1}{8}$ in. by chipping and filing, or by using a flexible shaft grinder. The center part of the piston fit is relieved by turning it down $\frac{1}{16}$ in. to $\frac{1}{8}$ in. smaller than a fit for the width of the keyway, as

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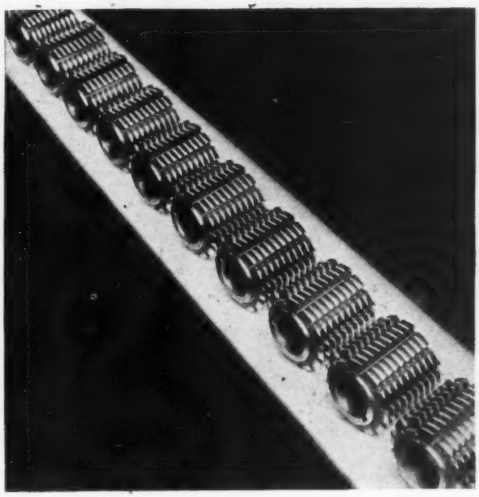

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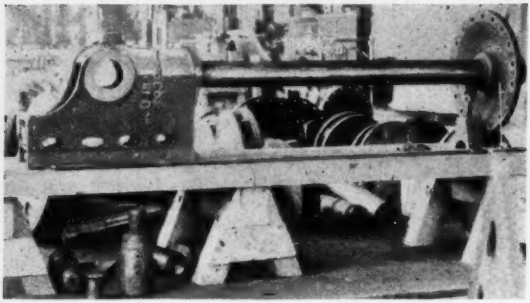
shown. This clearance is cut at the same time the piston fit is made in the lathe, before the keyway is drilled.

To fit the key, the rod is drawn tight in the crosshead with a draw key, then a sheet metal templet or standard taper is inserted into the slot and carefully marked flush with the crosshead where the small end of the templet comes through. This templet is used to lay off the key, which is then planed in the shaper. In laying off the key, it is necessary to make it somewhat larger than the actual size of the templet, as the templet fits loosely in the slot, whereas the key should be a sledge hammer drive. If the key is made to templet size—two inches above the mark on the templet—the fit will be approximately correct. Two inches on the taper will be equivalent to $\frac{1}{16}$ in. in the width of the key. ($\frac{3}{8}$ in. in 12 in. taper is equivalent to $\frac{1}{32}$ in. per inch.) This allowance is about right for a properly fitted key as, when driven tight, the key will "spring" slightly, and often the rod will draw back a little farther in the crosshead than it can be pulled with draw keys. On small work; that is, on older engines with smaller piston rods, the allowance may be decreased, and on heavy modern power with five-inch rods the allowance may be increased slightly.



Equipment for laying out a piston key slot.

To properly fit up a new rod is rather a neat job, but it is too often incorrectly done — as the amount of grief encountered by the roundhouse crew with pistons that lack "draw," and keys that work loose, would seem to indicate. The adjustable type of templet that is sometimes made with a toggle joint at each end should not be used for fitting piston keys; the taper should be maintained at standard.

Danly Condensed Die Set Chart

A chart by means of which it is possible to choose any one of 20 sizes and six different thickness combinations of the most popular die sets used for square, rectangular and round dies has been brought out by Danly Machine Specialties, Inc., 2122 South 52nd Ave., Chicago, Ill. The chart measures 17 x 11 in. when opened, and consists of a single sheet in place of the eight sheets formerly used in the standard catalog. By grouping the sizes, complete dimensions as to die space, largest round die which can be mounted in any other die set, thickness of punch and die holder, distance between pin centers, and so on all on one sheet, an immense amount of time can be saved.

This chart has been drawn up especially for the use of those who will want to keep it on the drafting board or tack it on the wall. As emphasizing the importance and convenience of standardization or simplified practice, it is interesting to note that by means of the 20 different sizes and the six thickness combinations, it is possible to employ more than 1400 different combinations from these standardized die sets. Blueprints are used to show the various dimensions. A copy of the chart can be obtained by addressing the firm at the above address.

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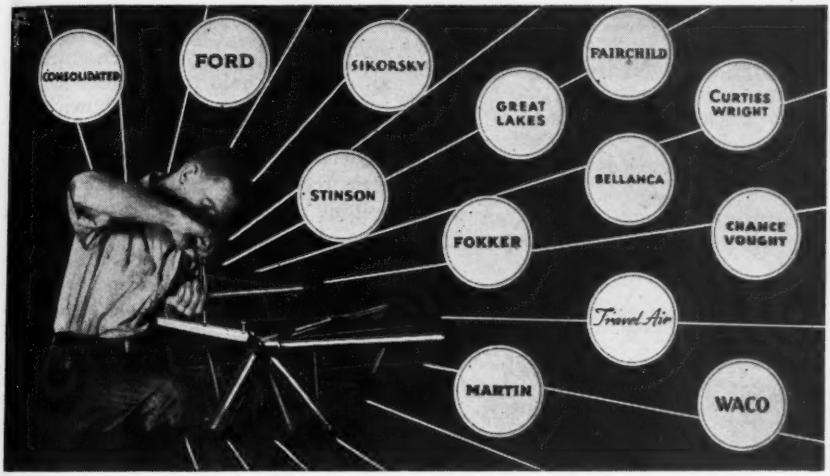

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Ideas From Readers

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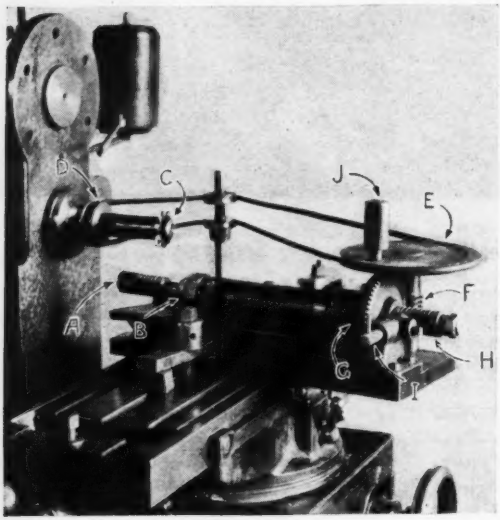
Fixture For Milling a Coarse Thread

By A. E. GRANVILLE

WHERE only a limited number of small pieces on which a coarse thread is to be cut are wanted, it is sometimes a puzzle to know just how to produce them accurately and within reasonable limits of cost. The fixture shown in the illustration offers a simple solution for certain classes of work.



Fixture For Milling a Coarse Thread.

In the example shown, the task consists in cutting a ½-in. pitch thread on a piece of 1¼-in. diameter machine steel. The piece is turned to ¾ in. diameter at one end, which furnishes an excellent hold for the chuck. The piece to be threaded is shown at **A**, and the chuck at **B**. The thread is milled with the cutter **C**, held on a stub arbor in the regular spindle of the milling machine. A small pulley **D** is also carried on the spindle nose. Over this pulley runs a round belt which also circles around the pulley **E**. Thus when the spindle revolves, power is transmitted to turn the worm **F**, which in turn revolves the worm gear **G**. The worm gear is keyed to the work spindle, on one end of which the piece to be threaded is held, and on the other end, the master thread **H** is cut.

The master thread is engaged by the piece **I**, which is stationary. When the mechanism is set in motion, the work spindle moves forward and rotates at the same time. Thus the correct amount of feed is obtained while the cutter **C** is milling the thread. The two threads are, of course, of the same pitch.

Forward or backward movement of the work spindle is possible through a splined shaft sliding in a keyed sleeve which is attached to the worm gear. This construction allows the work spindle to be held in bearings on its own slide, which can move in accordance with the feed-thread. The handle **J** is used to operate the mechanism when setting the work for a cut.

Method of Finishing Cams In An Engine Lathe

By H. L. WHEELER

OCCASIONALLY the design of a cam is such that the cam can be produced or developed in the engine lathe just about as cheaply as by any other method. The fixture shown in the illustration made it possible to turn cams in a lathe with both speed and accuracy.

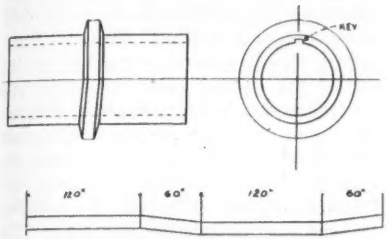


Fig. 1—Diagram showing design of cam.

The cam blank, Fig. 1, is finished all over and a keyway is broached in by means of which the cam may be driven on a special arbor. In the roughing operation the surface of the cam is finished on the periphery and the sides are left straight, the thickness of the cam being sufficient so that the cam can be generated in the final cam-turning operation.

The fixture, Fig. 2, consists primarily of the tool-block, the swivel plate upon which it is located, an arbor carrying a master cam on the tail-stock end, and a roller that bears against the master cam. The swivel plate that carries the tools is bolted to the cross-slide of the lathe in such manner that it can swing as actuated by the action of the roller in contact with the master cam. The swivel plate is provided with blocks, in which the right and left hand beveling tools are carried. These tools cut on the sides of the cam only. Set-screws in the blocks provide for adjusting the tools in both directions. The tools are of high speed steel and each tool is provided with elongated holes by which the tools are clamped after being properly set.

The work-arbor is provided with two keys that engage the keyway in the workpiece, the piece being held tightly between a collar at the head end and a hexagon nut, by which pressure is applied, at the tailstock end. This end also carries the master cam, which is keyed on. A cam roller, mounted on an arm that is bolted to the swivel plate, bears against the master cam and thus provides the movement which is necessary for the tools to cut the required shape on the cam. The roller is maintained in contact with the face of the cam by the use of weights, which are suspended from a cable that, in turn, is attached to an arm on the under side of the swivel plate. The cable passes from the arm over a sheave that is fas-

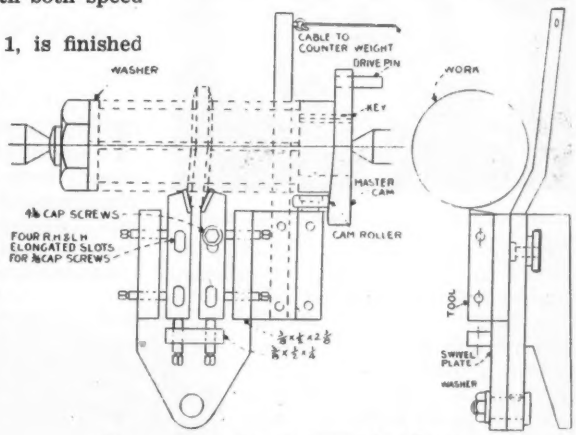


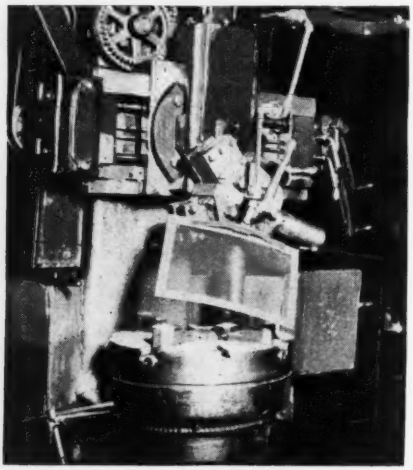
Fig. 2—Plan view of cam-turning fixture.

tened to the lathe at the end of the bed. When starting the operation, the tools are set central with the work and are fed straight in.

Boring Mill Chip Guard

By H. H. HENSON

THE taking of measures to prevent personal injury to the workers is now a part of the program of every modern industrial plant—and this includes the railroad shop. Permanent guards are set up around moving parts wherever possible, but movable guards are not always provided where they could be. The illustration shows a guard in use on a boring mill where large and small brass bearings are turned. This guard is both efficient and convenient.



Adjustable Chip Guard for Boring Mill.

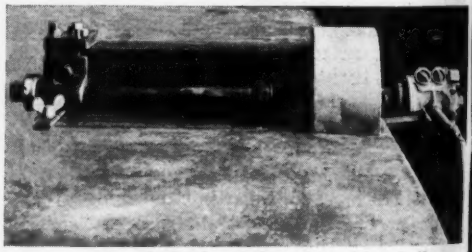
Every "brass" boring mill operator knows how easy it is for a hot chip to fly and strike the eye of anyone who may be within a ten-foot radius of the mill, yet the most efficient guard that has been devised thus far, in most shops, consists of a rag or piece of waste that is wound around the tool. The guard shown in the illustration is composed mainly of four members; three Barco ball socket joints, and the wire screen that forms the guard. In addition to these parts, a frame is required for the wire screen, and some ½-inch pipe in lengths to suit, with the required fittings. The screen should be of good quality, and 8 x 18 in. in size.

The guard can be attached to the top of the sliding head so that it will rise when the head is raised. The use of Barco or other similar ball joints will make it possible to adjust the guard to any position required, and thus the flying chips can be confined to the table of the machine. The guard can be built at a very nominal cost.

Air-Operated Sheet Metal Shear

By JOHN MCCULLAGH

THE illustration shows a home-made air-operated sheet metal shear of the rotary type, which was constructed for use in connection with miscellaneous sheet metal work. The shear is used only a small part of the time, therefore the motor was made detachable, so that it can be demounted at any time and used for other purposes. *(Continued on page 49)*



Home-Made Air-Operated Rotary Shear.

Ideas From Readers

(Continued from page 44)

The air motor drives a horizontal shaft through spur gearing which has a reduction of 6 to 1, thus making possible a speed of the correct number of r.p.m. for shearing. The shaft is mounted in two bearings, the bearing at the left-hand end being adjustable to compensate for cutters of different diameters. An adjustable stop plate, attached by means of a screw and wing nut, is provided. The plate fits into a slot cut in the top of the table, thus permitting a variety of adjustments to be made.

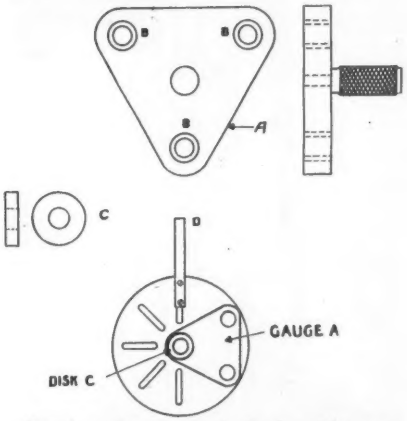
Making An Accurate Contour Gage

By CHARLES KUGLER

THE gage indicated at **A** in the illustration was recently ordered from a jobbing tool shop. Specifications required that the gage be ground all over, within limits of 0.0005 in. No difficulty was experienced in grinding the angles, but the grinding of the radii—½ in.—was rather more intricate. The method used was successful, however, and seems to the writer to be worth passing on.

The holes **B**, which were ½ in. in diameter, were drilled and reamed in approximately the correct positions before the gage was hardened. Afterward soft plugs were driven in and the button method was used to locate and bore the three holes to ⅜ in. This operation was performed in the bench lathe. Then the disc **C** was made, hardened, and ground to a diameter of 1.000 in., with a 0.375 in. hole.

The next operation consisted in turning and grinding a mandrel to a push fit for the 0.375 in. hole in the disc and gage. The disc was then wrung onto the mandrel, after which the mandrel was slipped into one of the holes in the gage, as shown in the lower part of the illustration. The gage, as shown, is clamped to a faceplate on the bench lathe. The periphery of the disc was given a light coating of Prussian blue, and the grinding attachment was mounted on the lathe, with the wheel in position so that the radial corner of the gage could be ground. A handle, **D**, was bolted to the faceplate so that it



Drawing showing method of making an accurate contour gage.

could be rotated and reciprocated by hand. The radius on the gage was then ground until the wheel just touched the Prussian blue on the periphery of the disc. Thus the correct radius was obtained, as was also the correct dimension between the three radial corners, which was very important.

While the drawing did not call for holes in the gage, holes were not objectionable; in fact, they lightened the gage, which was desirable.

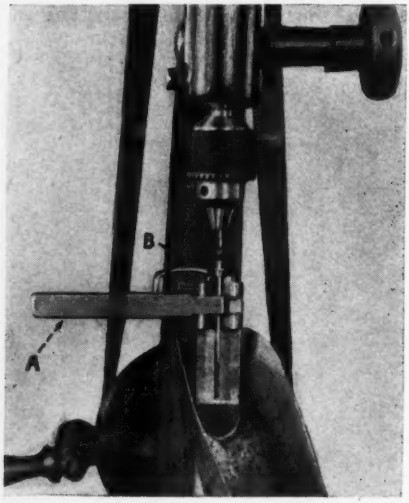
A "Speedy" Drilling Jig

By ARTHUR DOUGLAS

ONE of the neatest little drilling jigs I have seen for some time is shown in the illustration herewith.

The jig was designed to hold a small steel spindle so that a ⅛-in. hole could be drilled to a depth of ¾ in. in one end. The spindle has a flanged head, so the task of supporting the piece against the pressure of the drill is not a problem.

The jig consists principally of a vertical V-block, in which the piece



A simple, but fast, drilling jig.

is held and prevented from turning by the hand lever **A**. The lever is hinged at the left side; thus pressure is applied against the piece by pulling the lever outward—toward the operator—while the drilling operation is in process. A light pull only is necessary, as the torque, or twisting tendency, is very little. As the hole is finished and the drill is raised, the operator pushes back on the hand lever until the curved knock-out **B** strikes the work, dislodging it so that it will fall into the chute below. Another spindle, which in the meantime has been picked up, is placed in the jig with the right hand, the lever is pulled back, and the operation is repeated. A small spring, connected to the hand lever, also holds the lever lightly in place against the work and will hold the piece in place until hand pressure is applied.

Calendar of Coming Events

SEPT. 21-25—Annual Meeting of American Society for Steel Treating and National Metal Exposition, at Commonwealth Pier, Boston, Mass. W. H. Eisenman, Secy., 7016 Euclid Ave., Cleveland, Ohio.

OCT. 12-16—Twentieth Annual Safety Congress, at Civic Opera Bldg., Chicago, Ill.

OCT. 13-16—Twenty-fifth Annual Convention of Illuminating Engineering Society, at William Penn Hotel, Pittsburgh, Penna. Secy., Illuminating Engineering Society, 29 West 39th St., New York, N. Y.

NOV. 30-DEC. 4—Annual meeting American Society Mechanical Engineers, at Engineering Societies' Bldg., 29 West 39th St., New York, N. Y. Calvin W. Rice, Secy., same address.

NOV. 30-DEC. 5—First National Exposition of Mechanical Handling Equipment, at Grand Central Palace, New York, N. Y. Chas. F. Roth, Mgr., International Exposition Co., Grand Central Palace, New York, N. Y.

Gilmer Co. Issues V-Belt Catalog

The L. H. Gilmer Co., Keystone at Cottman, Philadelphia, Penna., has issued a V-belt catalog which practically comprises a text book on this subject. The book is divided into two sections, the first of which is devoted to theoretical and practical illustrations of V-belts and their operation in multiple drives for various classes of service. The second section is devoted to the engineering of V-belt drives, and introduces new, simple, and original formulae for all V-belt calculations, detailed tables of drives from fractional horsepower to horsepower running into the hundreds, a large chart for quickly determining center distances, belt lengths, and other useful data.

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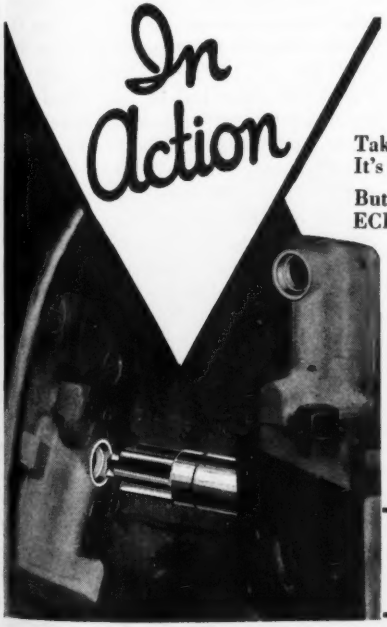

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Over the Editor's Desk

Let's Go!

WHILE everyone has been looking hopefully for signs of returning prosperity, a certain amount of uneasiness and apprehension has been felt that the coming of better times might be retarded by conditions in other countries. It is true that the rest of the world is no better off than we are, but, according to William G. Shepherd in "Collier's," the world is simply waiting for us to get started and then the other countries will start also.

Mr. Shepherd says: "Half the business of the entire commercial, industrial, and financial world is done by the United States, though our population is only one-sixteenth of the world's total." And the reason, as he explains it, is that we are the machinery masters of the world. In other words, our ability to produce practically anything on a high production basis has given us an advantage in the world's markets that has enabled us to corner 50 per cent of the total business of the world. The natural result is that the other nations depend very largely for guidance upon America, and at this moment are looking to us to lead them out of the wilderness of depression. Leadership entails responsibility.

Only when our attention is focused upon the matter do we realize the extent to which the rest of the world is depending upon the United States for markets for rubber, silk, coffee, and other articles of trade. And, incidentally, they are depending on us for automobiles, cotton, canned goods, machinery, and all sorts of other commodities that they have gotten into the habit of purchasing from America.

We predict that as the tide of prosperity rises in this country, the level will rise correspondingly in the rest of the world and once Old Man Depression is started toward the exit, he will fade out of the picture so rapidly that his final departure won't even be noticed. Let's go!

An Invaluable Adjunct

WE have just been casually scanning the pages of a book, "Arc Welding In Industry," put out by the General Electric Company, in which all the various kinds and types of jobs that can be done with the aid of the welding outfit are pictured. Here is an art that has developed with vast speed and has reached a point where it is an essential art of all metal-fabricating operations. Prior to the World War it had assumed little importance in industry, but since the war it has been put to unlimited uses. As a method of salvaging machinery parts that have failed or have become damaged or broken it has no equal, and it can be used in places that would be inaccessible to other types of repair equipment. Originally used solely for repair operations, it soon found a place among production equipment and is now considered indispensible on many manufacturing operations.

The welding process has been used for some time in the construction of large tanks, machine frames, pipe lines, tunnel sections, jigs and fixtures, and so on, and now it has proved its value in the fabrication of steel-frame buildings of all sizes. The welding outfit is an important part of modern manufacturing equipment.

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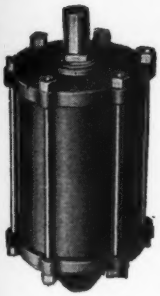

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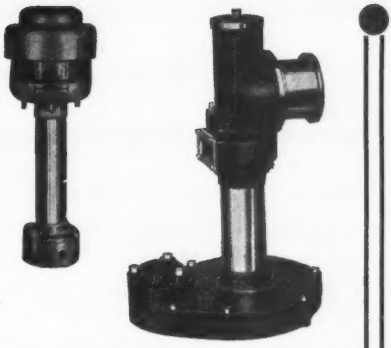

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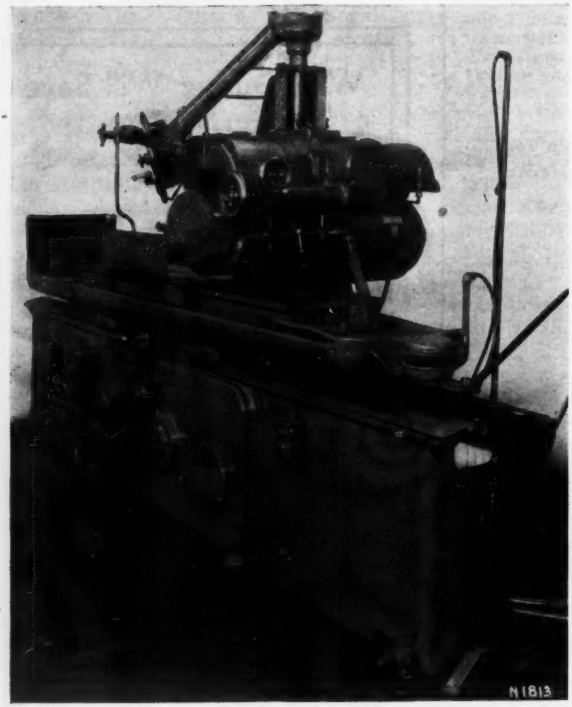
New Shop Equipment

Norton Improved 15 x 15-In. Open Side Surface Grinding Machine

An arrangement has been perfected whereby the spindle pulley and counter-shaft formerly used have been eliminated from the design of the 15 x 15-in. open side surface grinding machine made by the Norton Company, Worcester, Mass. The rear portion of the grinding wheel slide is made cylindrical in shape, and is bored to receive a standard motor field, which is pressed into place. The wheel spindle carries a standard rotor which runs in the stator with the proper clearance, this design also eliminating the use of three belts and a wheel drive drum and pulleys. The spindle and rotor unit is carefully balanced, so that it runs with absolutely no vibration. In addition, it is said that approximately three times as much power is transmitted to the grinding wheel as was possible with the old type of drive.

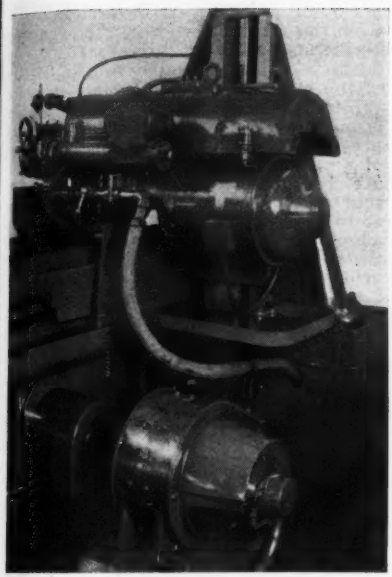


Norton 15 x 15 x 6-In. Open Side Surface Grinding Machine

The wheel spindle bearings are of hard bronze, tapered on the outside for adjustment and lubricated by means of sight feed oil cups on the slide. The rating of the spindle motor is 15 h.p. at 1200 r.p.m., constant speed. The unit is air-cooled by a fan that is mounted on the rear end of the spindle.

Other improvements in the machine include a new 30 : 1 double worm reduction gear for the table drive, and the installation of a motor-driven "Fulflo" pump unit for the grinding lubricant. The table drive, which is accomplished by the use of a reversing type motor coupled directly to the table drive reduction gear with the final drive consisting of a spur gear engaging the table rack, has not been changed.

It is claimed that the machine as now built is extremely quiet and smooth in operation and produces an excellent quality of finish. Production is also increased due to the additional power available at the grinding wheel. The



View of new integral wheel slide and motor, and reversing motor for table drive.

machine mounts a 14 x 6 x 5-in. grinding wheel, and will be built in three lengths: 6 in., 8 in., and 10 inch.

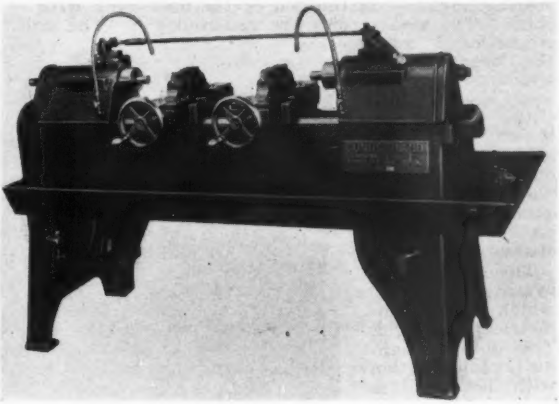
Sundstrand No. 56 D. E. Drilling and Centering Machine

To meet the demand of the metal-working industry for a more substantial, powerful, and rigid centering equipment, the Sundstrand Machine Tool Company, Rockford, Ill., has placed on the market the No. 56 D. E. Drilling and Centering Machine shown in the illustration. The machine represents the combined experience of many years in the design of centering machines. The tool is more than a centering machine, as reaming, spot facing, and tapping operations can be performed with equal efficiency, especially where both ends of a part can be machined simultaneously.

The right-hand head of the machine, as well as both of the vises, can be adjusted longitudinally to suit the work. Spindles can be operated simultaneously or independently. Vises can be operated independently by means of hand wheels or, by special arrangement, both vises may be operated in unison through one hand wheel. Air-operated vises can be furnished if desired.

The spindles are of forged high carbon steel, heat treated and ground. They are mounted on Timken Precision Bearings both front and rear, with suitable provisions for thrust and adjustment. Oil pockets between bearings insure a liberal supply of lubricant. The spindles are provided with No. 3 Morse tapers as standard, and adapters can be provided to accommodate No. 3 or No. 20 Jacobs chucks. A 19/32-in. hole through the spindle provides for the draw-rod. Stop nuts are provided for accurately controlling the depths of center drills or other tools. The spindles are driven through wide-faced spur gears with Micarta idler gears to insure silent operation.

Quill type mountings are provided for the spindles, the quills being semi-steel, accurately ground and fitted to the drill heads. Quills are actuated by means of a rack and pinion, providing a 4-in. independent movement or a 1¾-in. simultaneous movement. The spindle heads are of rigid construction and accurately scraped to the vees of the machine bed, assuring positive alignment. The right-



Sundstrand No. 56 D.E. Drilling and Centering Machine

hand adjustable head is securely clamped in operating position by means

View showing drive and speed-change arrangement.

of clamping screws located in an accessible position.

The vises are provided with large bearing surfaces on the bed of the machine. The vise screws are generously proportioned and the bronze nuts, which are 2½ in. long, are equipped with ball thrust bearings. The jaw inserts are of hardened steel. Jaws may be offset for camshafts or other pieces of irregular shape.

The bed is of pyramid design, which is both symmetrical and rigid. The double channel construction with heavy cross ribbing precludes the possibility of warpage or deflection. A coolant tank of ten-gallon capacity is located in the right-hand machine leg, and a coolant pump with a capacity of five gallons per minute is mounted on the leg directly over the oil pan, where it is driven by belt from the main driveshaft.

The motor is mounted in the left leg of the machine, and drives the machine through a Vee belt. Suitable provision is made for belt takeup, and guards are provided as standard equipment. Motors of from 1 to 5 h.p., 900 to 1800 r.p.m., are recommended. A combination of four quick change speeds ranging from 85 to 1800 r.p.m. can be provided by the adoption of a Westinghouse-Wise Multi-Speed Drive. Capacity is two 1-in. drills in steel. Maximum work diameter, 6 in., either round or hexagonal. Length, up to 72 in., depending upon the size of the machine. The width of the bed is 11 in.; distance top of bed to center of spindle, 6 in.

Cincinnati Semi-Automatic Infeed For Multiple Diameter Work

A semi-automatic infeed unit which is said to provide improved means for rough and finish grinding cylindrical shafts having multiple diameters has been announced by Cincinnati Grinders, Inc., Cincinnati, Ohio. The unit, utilized as shown in Fig. 1, where it is shown applied to a Cincinnati 14 x 48-in. plain self-contained grinder, is said to substantially increase the production of multiple diameter work by grinding with corresponding labor savings.

The unit is electrically and hydraulically controlled, and the operation of a machine to which the unit has been applied is very simple. After the set-up

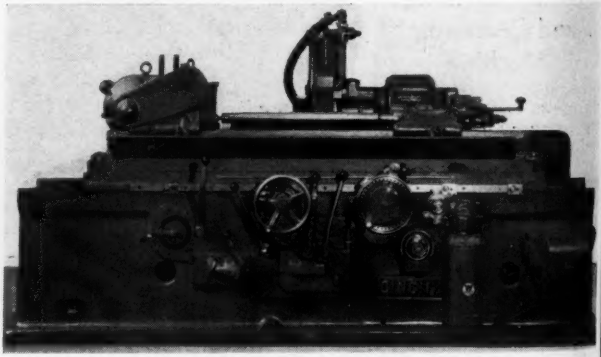
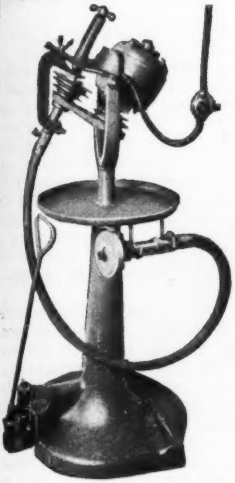


Fig. 1—Cincinnati Grinder Equipped With Semi-Automatic Infeed for Multiple Diameter Work.



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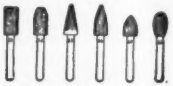

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and adjustments have been made, the unit requires very little attention until work of a different size is to be ground. Once the shaft is placed between centers, it remains in position until it is completely ground. All diameters of each shaft are therefore ground with but one handling of the work.

The semi-automatic infeed unit is located on the bed of the machine, directly in the rear of the wheel head, as shown in Fig. 2. Positioned in the rear of the unit is a flat master cam which is made up of a series of steps, each step corresponding to a diameter of the work being ground. The cam controls the relative positions of the wheel and work, and is machined and ground to very close limits to insure consistent limits of clearance between the wheel and work. The rear unit also contains six solenoid stops which, when in use, act to control the longitudinal travel of the master cam so as to bring the proper step on the cam in line with a positive block stop. This block stop contacts with the step on the cam, representative of the diameter of the work being ground.

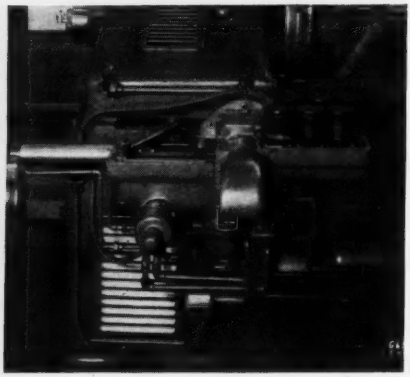

Fig. 2—View of Semi-Automatic Infeed Unit.

A master drum switch with a star control wheel having six notches (for use with job shown) is located on the front of the machine. This control wheel is indexed by station dogs as the table is hand-traversed. When the star wheel is indexed by a station dog, a corresponding contact point in the master switch is closed, actuating the corresponding solenoid stop. This stop limits the amount of cam travel, thus bringing the proper step of the cam in line with the positive stop block for diameter sizes.

As crossfeed handwheel is given a one-eighth turn counter-clockwise, a valve is opened which operates a piston that controls the cam bar. The wheelhead travels rapidly toward the work until the positive block step contacts with the proper step on the cam and from this point, which positions the grinding wheel approximately 1/64 in. from the work, the wheel is fed to the work by the hand infeed wheel. Limits of plus or minus 0.002 in. are held on all diameters, which are well within the tolerances usually required on commercial grinding.

By turning the crossfeed handwheel clockwise, the hydraulic valve is reversed and the wheel travels back to its original position. The distance of rapid cross feed to the wheelhead is approximately 1¼ in. Accordingly, all types of multiple diameter work with no greater variation than 2 in. between the several diameters can be ground with the unit. By removing all the dogs on the table and setting the star wheel drum switch so that the wheelhead infeed movement will be controlled by a single cam, the machine can be used efficiently on single diameter work.

The table type turning fixture is easily positioned for dressing the wheel.

Natco Model D-5 Multiple Drilling and Tapping Machine

The National Automatic Tool Company, Richmond, Ind., announces the development of a universal machine with a wide range of adjustments which will enable it to handle work of varying sizes. The machine is to be known as the Model D-5. It can be built as a drilling machine only, as a tapper only, or as a combination driller and tapper. The machine has a capacity of ten ⅝-in. drills or ten ⅞-in. taps in mild steel.

The head has a drilling area of 5⅛ x 10 in., and is built to receive 10 spindles. Provision has been made for the omission of any that are not needed. The spindles are held in place by an adjustable arm which is bolted to the underside of the head flange, a vertical adjustment of 1¼ in. being provided on all spindles to compensate for drill grinding.

The standard spindles are reamed and threaded to receive the new Natco collets for straight shank drills and taps. When taps of different pitch are used, it is necessary to provide a float in the

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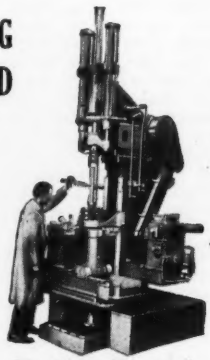

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spindle. When taps are of equal pitch, a standard drilling spindle may be used on tapping operations. The Natco spring collet, which is made of oil-tempered spring collet steel, is bored for the specific size of drill or tap to be

Natco Model D-5 Multiple Drilling and Tapping Machine

used. The collet has a three-point clamping action which centralizes the tool properly. A three-point wrench distributes the torque load when clamping, and does not tend to twist the collet jaws out of round. The larger sizes of collets are provided with a broached square to drive the tool, a method much superior to the old pin drive.

The column is of substantial box form construction, providing a rigid support for the neck, head and table. The electrical equipment and wiring are concealed within the column and protected by it. The table is mounted on a sliding post which is carried in an adjustable knee. The post is connected through a rack and pinion with a feed lever which extends downward on the right side of the knee for foot feed. The working surface of the table is surrounded by a coolant channel which drains into a reservoir in the base of the machine.

The correct spindle speeds are obtained by transposing pick-off gears in the top of the head, making it possible to bring work with varying drill and tap sizes to the machine. High and low speed upper joint assemblies are standard equipment and can be furnished as required. The individual spindle speed change is made by means of a slip bushing construction which consists of the upper joint bearing and gear assembly. The speed change can easily be made while the arms are removed for set-up purposes.

The "arm-type" limit switch controls the point of tap reversals, and insures exact depths on blind hole tapping. The switch is of compact design and is mounted on an adjustable arm so that it can be moved about to locate the trip mechanism as closely as possible to the tap, on the part being tapped. A special ball-bearing motor was designed to withstand the severe reversal load without overheating. The 1 h.p. motor is capable of 50 reversals or 25 complete working cycles per minute. The 2 h.p. motor is capable of 30 reversals or 15 complete working cycles per minute.

With the exception of the upper spindle bearings, all gears are mounted in Timken roller bearings. The upper spindles are of high grade bronze and are accurately machined to insure complete interchangeability. All gears are of hardened alloy steel. The complete assembly is packed in grease to insure ample lubrication.

Feed is applied through a float-operated lever to a table upon which the work is placed. This method of applying the feed permits the operator to use his hands freely in handling the work. When desired, a hand lever can be used to replace the foot lever.

Peerless No. 3 Special Burring Machine

The City Machine & Tool Works, June and East Third Streets, Dayton, Ohio, has brought out the Peerless No. 3 Spe-

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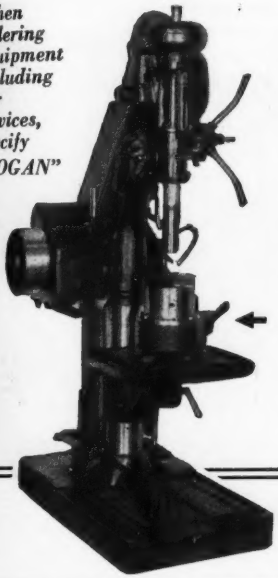

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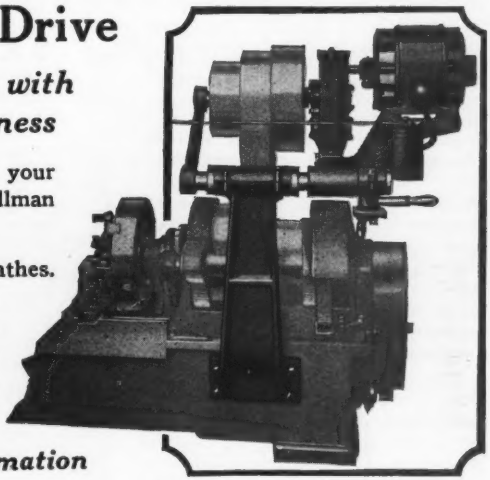

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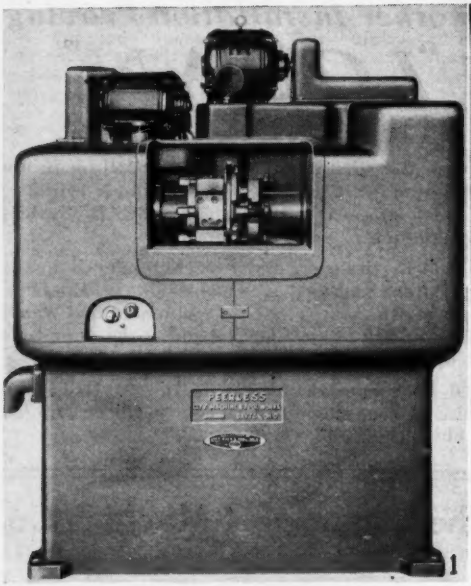
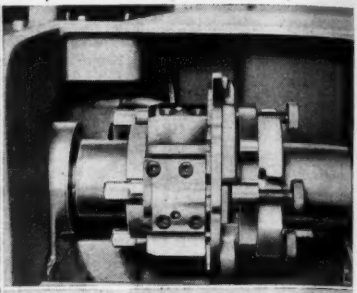




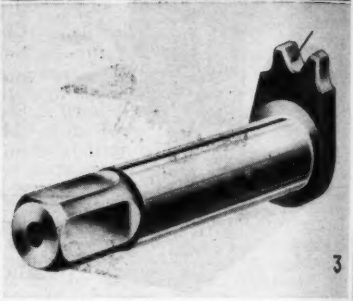


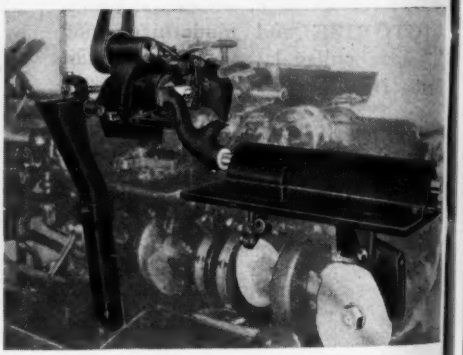
Fig. 1—Peerless No. 3 Special Burring Machine. Fig. 2—Close-Up View of Turret Station. Fig. 3—Automatic Steering Gear Sector for which the machine shown in Fig. 1 has been set up.

cial Burring Machine shown as Fig. 1 of the accompanying illustrations. The machine as shown is equipped to remove the burr in chamfering an automotive steering gear sector, shown as Fig. 3. The arrow points to the chamfer produced by the machine. This operation, which was previously performed by hand in a manner which was slow, tedious, and expensive, is performed with the aid of the No. 3 machine at a rate of 460 per hour. In addition to economy, this method provides uniformity and quality which was impossible by the hand method.

The machine turret—shown in Fig. 2—operates at a continuous but variable rate of speed, and after the machine is set up, the operation resolves itself into a matter of unloading and loading the parts into the turret fixture. Although the part in process has but two teeth, the machine can be arranged to handle three or four teeth with equal satisfaction.

B & S Nut-Tapping Attachment

Brown & Sharpe Manufacturing Company, Providence, R. I., has augmented its line of screw machine equipment by



B & S Nut-Tapping Attachment.

the addition of a nut-tapping attachment. The attachment is of the second operation type and is fastened to the

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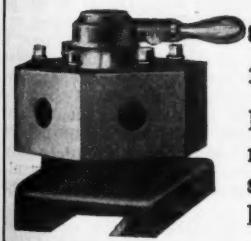

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Furthermore, they found that there is a POLDI Tool Steel for every requirement—a POLDI Tool Steel for making die casting dies, blanking dies, taps, thread gauges as well as innumerable other jobs where a good tool steel is necessary—all stocked, ready for prompt delivery from warehouses.

Try a POLDI Tool Steel on one of your tough jobs. Find out how it will lower your costs and increase your production. A trial will convince you, too, that there is real economy in the use of POLDI Tool Steels.

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Poldi Steel Corporation of America

247 West 18th Street.....New York
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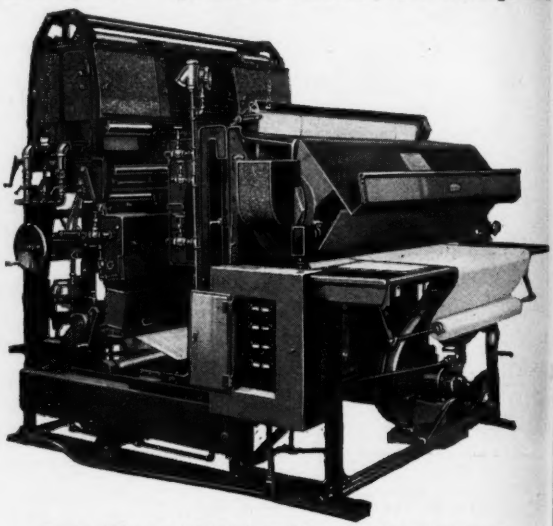
Representatives in
Hartford, Boston, Stamford, Cleveland, Newark

machine above the front cross slide.

A transporting arm takes the part, after it has been cut off at the main spindle of the machine, carries it to an intermediate position where a countersinking operation is performed on the back end, and then to the tapping unit proper. Here the nut is placed in a revolving chuck and automatically fed over a bent-shank tap. As successive nuts are fed along the tap, those previously tapped are pushed along the shank and dropped into a chute which leads to the work pan. The tap is held in position by the nuts, which, as they are fed along the shank, bear on two bushings.

The attachment is made in three sizes, for use on the Nos. 00, 0, and 2 machines, both the regular and high speed types, also on the screw-threading machines. On belt-driven machines the attachment is driven from overhead or by an attachment driving stand, while on motor-driven machines it is driven by an individual motor.



Pease "Peerless" Model 25 Blue Printing Equipment

Pease "Peerless" Model 25 Blue Printing Equipment

Blue prints, negatives, blue line and brown line prints can now be produced at any required printing speed up to 12 ft. per min. with the Pease "Peerless" Model 25 Blue Printing Equipment shown in the illustration. The equipment is being marketed by The C. F. Pease Company, 815 N. Franklin Street, Chicago, Ill. It is composed of three units: the blue printing machine, the washing machine, and the potashing, washing, and drying machine.

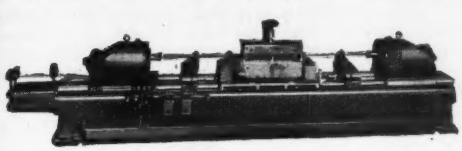
The blue printing machine can be operated independently from the washing, potashing, and drying equipment, by the manipulation of a simple clutch adjustment. Thus the blue printing machine can be installed and the rest of the equipment added later, if desired. All units are made in two sizes, of 42-in. or 54-in. widths, and the machines can be wired to operate on 220-volt current, either direct or alternating. The 42-in. machine is equipped with six lamps and the 54-in. machine with seven lamps. Each lamp consumes 6½ amperes on D. C. and 7½ amperes on A. C., but the amperage can be increased if faster printing speed is required.

As with all "Peerless" machines, when operated continuously the tracings and paper are laid face up on a continuous roll of paper feeding in at the front of the Model 25 machine. They are carried upward, around the contact glass, past a glowing bank of Universal high power arc lamps which radiate an intense light that is rich in the actinic rays that are so valuable for accurate exposure and fine reproduction work. All lamps are mounted in horizontal alignment to give uniform light distribution and fast printing speed with full effect of the light rays.

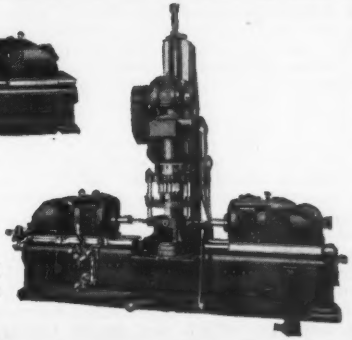
After the exposure has been made, tracings are automatically returned into the tray at the front of the machine while the prints, which are made on a continuous roll of paper, are carried through the machine and subsequent operations of washing, potashing, and drying. When making single prints, both the tracing and the paper are returned into the tray and prints can then be individually washed and dried by means of a separate sheet washer and dryer.

The machine is powered with a varia-

STANDARD & SPECIAL DRILLING & BORING MACHINES



Above—Horizontal Duplex Machine for long-hole drilling.



Right—Combination Vertical and Horizontal Machines to meet special requirements.

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Established 1872

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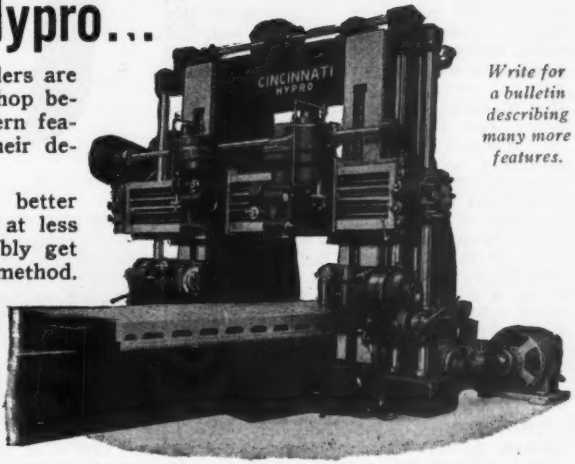
. . . . Planer Type Millers are real producers in any shop because of the many modern features incorporated in their design.

These features mean better work, in less time and at less cost than you can possibly get with any other similar method.

These features are good reasons why you should investigate Cincinnati Hypro Planer Type Millers for your shop. Send for your catalog today.



Write for a bulletin describing many more features.

THE CINCINNATI PLANER CO.
3100 SOUTH STREET -:- -:- CINCINNATI, OHIO

ble speed ¼ h.p. motor and has a speed range of from 4 in. to 12 ft. per min. A gear shift lever makes either high or low speed immediately available, or it can be shifted into neutral. When printing continuously, chemicals are removed by a series of spray jets which spray both the front and back surface of the paper. After washing, the prints pass over in contact with the chemical roll applicator set in a shallow tray at the bottom center of the machine, which revolves the same direction as the paper is traveling, and either potash or negative solution is uniformly applied over the surface of the prints. Both solutions are fed into the tray automatically and can be alternated as required. After developing, the prints are again washed by a second spray jet water wash arrangement.

The dryer is of the twin-radiator air-type, consisting of two banks of heating units between which the paper travels around a floating idler roll that can be raised or lowered by means of a crank handle, thus making it easy to thread the paper through the machine. The machine can be equipped with either gas or electric heater, as specified, and provision is made for accurately controlling the drying temperature. The gas heated type dryer has two radiator heating units which, when operating at full capacity, consume approximately 50 cu. ft. of gas per hr. each. The electrically heated type dryer has two coil radiator units which, when operating at full capacity, consume approximately 60 amp. per hr. each. A particular feature of this machine consists in the special side doors and sliding panels, which assist the operator to overcome difficulties in humidity and still enable him to see the finished prints as they pass over the dryer and into the rolling-up device at the rear of the machine.

The 42-in. machine is 5 ft. 11 in. wide, 2 ft. 11 in. deep, and 5 ft. 7 in. high. The 54-in. machine is 6 ft. 11 in. x 2 ft. 11 in. x 5 ft. 7 in. The heating equipment adds approximately 5 ft. to the depth and 2 ft. to the height of the machines.

Simplex Production Vise

The Simplex Tool Company, Woonsocket, R. I., has brought out a vise that is operated by a foot treadle instead of by the usual hand lever, leaving the operator's hands free to place work in position in the vise. The vise is intended primarily for production work. The vise jaws are opened by the action of pressing down on the foot treadle, and are closed by means of a 300-lb. spring that is released when the foot is removed from the treadle. The spring snaps back and pushes two hinged pieces up from a V position, effecting a toggle action which provides tremendous pressure.

The vise can be set to accommodate different sizes of work by turning a knurled screw in the front part of the vise which works in a nut held in the back jaw, similar to the usual vise screw. With this screw the jaws are opened to nearly the thickness of the piece, then the foot treadle is used to open the jaws enough to insert the piece. When the jaws have been set, the foot treadle only is used to operate the vise, as long as the pieces are of practically the same thickness. The movement of the vise jaw by the foot treadle is approximately ½ in., which is more than enough to release the work.

Simplex Production Vise

The vise is mainly constructed from parts that are used in the standard machinists' vise made by this firm, and the toggle mechanism, which is independent of the vise, is so designed that it can be applied to any of the various sizes of vises made by the company.

M-C GEARS
Save You Money

And We Can Prove It!

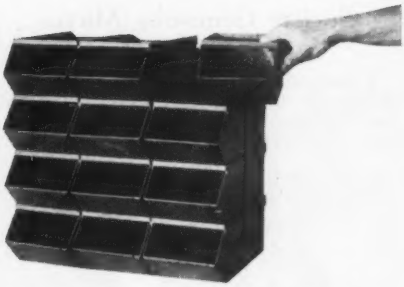
Take *any* gear job you are now cutting in your shop . . . send us prints of that job . . . and let us quote you. We'll prove to you that M-C Gears *will save you money.*

And, besides saving on the initial cost, *you'll get a better gear.* You'll get a gear that is made accurate enough to meet every requirement . . . accurate enough for any machine or precision instrument. You'll get the best gear that money can buy—M-C Gears.

So, send us those prints *today!* There's no obligation!

This illustration shows a variety of M-C Gear Products

MEISSELBACH-CATUCCI MFG. CO.
70 STANTON STREET
NEWARK NEW JERSEY



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WHEN you use . . . STACKBINS . . . parts are always in view . . . production is speeded up . . . workers become more efficient . . . there is a saving of space, time and costs.

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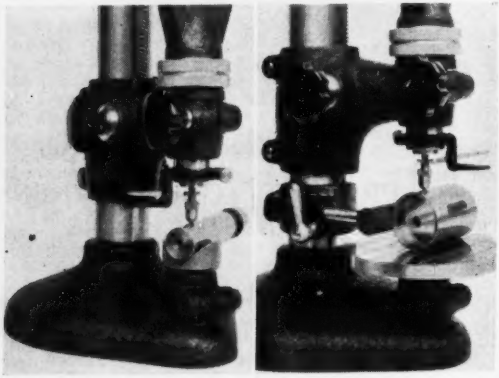
Societe Genevoise Micro-Indicator Tables

A modification of their micro-indicator stand No. U-3 is being offered by the Societe Genevoise d'Instruments de Physique through their agents, The R. Y. Ferner Co., Investment Bldg., Washington, D. C., with which a vee-block can be used as the table for checking small cylindrical pieces or a flat table can be used for checking larger work. The vee-block, shown at the left in the illustration, is intended for use in measuring work from ⅛ in. to 2 in. diameter, and the flat table, illustrated at the right, is intended for use in checking work up to a maximum of 6 in. diameter. The flat table is 4⅛ in. in diameter, and is case hardened and lapped. It is provided with cross grooves to aid in keeping the surface clear of dust and to provide for a good contact with the standard flat gage blocks when they are wrung onto it to establish the zero setting of the instrument.



(Left)—Societe Genevoise Micro-Indicator Stand With Vee-Block. (Right)—Stand With Hardened and Lapped Table.

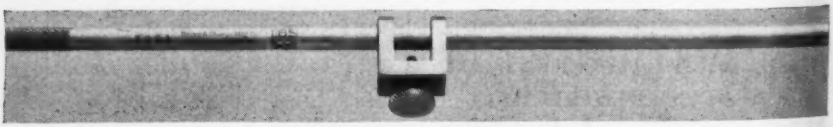
An adjustable square is also furnished for attachment to the column of the stand to serve as a stop piece against which cylindrical test pieces may be rolled to the correct position for reading on their diameters. The micro-indicator used in taking these measurements has adjustable tolerance marks which can be set at any desired point up to 0.003 in. either side of zero. The indicator is also provided with a lifting clip by which the contact plunger can be raised for the insertion of the workpiece beneath the spherical or flat contact anvil without the necessity of rolling or sliding the piece under the anvil each time, thus avoiding wear on the contact surface. These facilities make rapid inspection of parts an easy matter.

The micro-indicator can be supplied graduated to 1/2,000, 1/5,000, 1/10,000 or 1/20,000 in. per division, according to the grade of accuracy required. The instruments are guaranteed to read accurately to one per cent of the total range of the dial, which varies from 0.020 in. to 0.006 in., according to the manner of graduation.

B & S Height Gage Depth Attachment

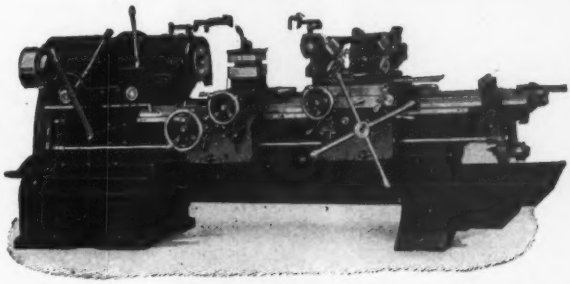
An attachment with which a Vernier height gage can be quickly converted into a reliable and accurate depth gage has been placed on the market by the Brown & Sharpe Manufacturing Company, Providence, R. I. The attachment makes it possible to measure depths easily and accurately, and to take measurements over high projections and in deep recesses. It is easily locked in place on the Vernier by means of a clamp screw, as shown in the illustration. The attachment is made of a fine grade of steel, hardened and ground and accurately finished at the ends.

The gage is made in two sizes, the



Brown & Sharpe Height Gage Depth Attachment

ACME Features *Will* Cut Your Costs!



AND, you can depend upon an ACME Universal Turret Lathe for lower costs, because of the features incorporated in its design.

These features include twelve reversible spindle speeds, twelve independent reversible feeds in apron, heat treated sliding gears, multiple disc clutch, roller bearing superior mounted spindle and many others.

Submit your problems to our field engineers and research department.

The Acme Machine Tool Company

CINCINNATI, OHIO

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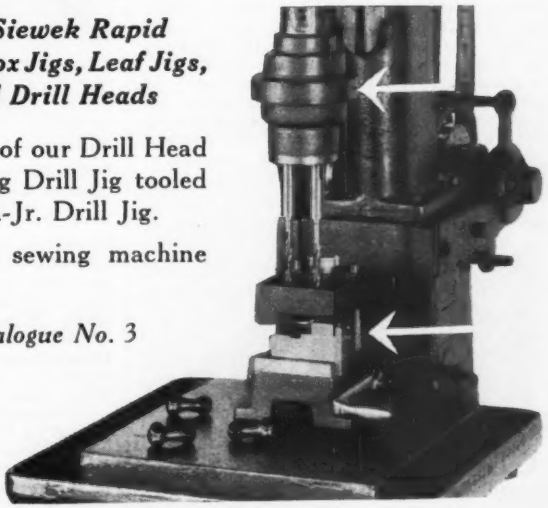
Manufacturers of Siewek Rapid Clamping Drill Jigs, Box Jigs, Leaf Jigs, Fixture Locks and Drill Heads

This cut shows a set-up of our Drill Head and our Rapid Clamping Drill Jig tooled complete on the Type A-Jr. Drill Jig.

This job is in a large sewing machine company in the East.

Write For Our Catalogue No. 3



The SIEWEK TOOL COMPANY

10232 Woodward Ave.
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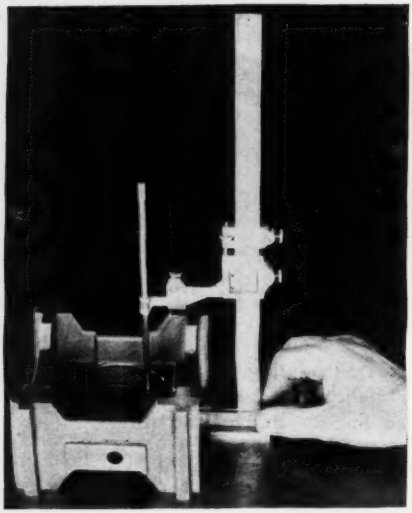


B & S Height Gage Depth Attachment In Use.

No. 585A for use on a 10-in. Vernier height gage, and the No. 585B for use on an 18-in. height gage.

Logan Model "GN" Foot Control Air Valve

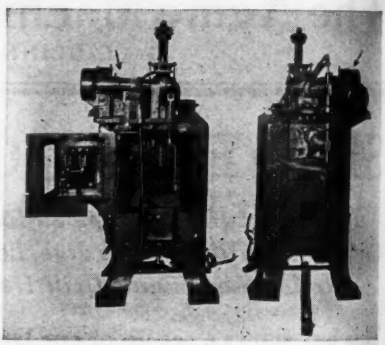
The illustration shows the Logan Model "GN" Foot Control Air Valve, which has been placed on the market by The Logansport Machine Company, Logansport, Ind. The control valve is of the single pedal reversing type, so designed that the pedal is returned and the valve is reversed when the operator's foot is removed from the pedal. This automatic mechanism is operated by a small air piston that is mounted under the foot pedal.

Logan Model "GN" Foot Control Air Valve.

The foot pedal has been designed to conform to the natural position of the operator's foot, making it unnecessary for the operator to raise his foot off the floor to operate the foot pedal. The valve is easy to operate and causes no fatigue. The valves are regularly manufactured in ⅜-in., ½-in., ¾-in., and 1-in. pipe sizes.

"Ohio" Gears and Cams Reduce Operator Fatigue In Spot Welding

The Taylor-Winfield spot welder shown in the illustration has been specially designed for continuous operation in plants where mass production methods are used. The welder is semi-automatic and is so arranged that fatigue-producing labor is reduced to the minimum. The operator merely inserts the strips or pieces to be welded, presses the pedal, and the machine will apply the correct pressure, turn on and cut off the welding current, and release the finished weld. This sequence of operations is accomplished by means of a motor drive through cams and gears that are manufactured by the Ohio Gear Co., 1333 East 179th Street, Cleveland, Ohio.



Front and rear views of the Type N-3 Taylor-Winfield Electric Spot Welder, showing timing and tripping cams and speed reducer.

The speed of the ½ h.p. motor is reduced to the slow speed necessary for raising and lowering the upper welder jaw—approximately 60 to 120 r.p.m.—by a worm and worm wheel. The worm

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IF . . . two marking heats are sufficient to meet *all* your requirements. . .

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B

eliminate tap breakage!

WITH the ordinary type of chuck, taps usually break long before they are worn out . . . creating excessive waste and high costs!

But, why break taps? Wear them out . . . use the APEX SAFETY FRICTION CHUCK. It is guaranteed to prevent tap breakage.

In addition, APEX FRICTION CHUCKS are also used on air and electric tools for stud setting, nut driving and screw driving. It prevents stalling of motor, eliminates vibration and chatter of clutch when nut is set, prevents screw driver bit from marring screw head or work. Used with reversible tool for stud setting.

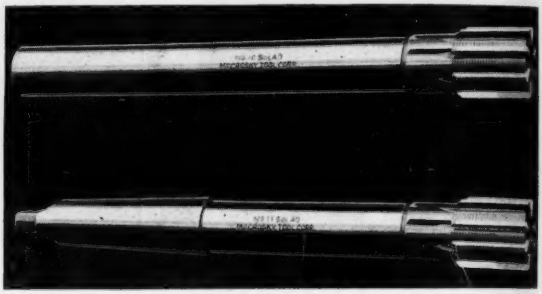
Investigate the APEX FRICTION CHUCK for your shop . . . it will save you money! Write for catalog.

THE APEX MACHINE & TOOL CO.

300 DAVIS AVENUE, DAYTON, OHIO

shaft drives the reciprocating arm mechanism through a timing clutch similar in principle to that of a punch press; that is, the pedal may be pressed down at any time, but the clutch will not engage until a certain point of the revolution of the shaft. The arm motion is obtained through a cam, and a second cam controls the primary transformer current.

The motor and worm and worm wheel operate continuously while the machine is in work, the outer movements being started and stopped by the operator. He first places the work in position and depresses the pedal, throwing the timing clutch into position to engage at the proper instant. The clutch engages and forces the upper welder jaw, or arm, down upon the work through the medium of a powerful adjustable spring. Immediately thereafter the switch cam closes the primary switch and the welding current passes through the work by means of water-cooled electrodes, thus heating the material. The switch cam then turns off the current, completing the weld, and the pressure cam allows the upper arm to return to its normal position, releasing the finished weld. The timing clutch finally disengages and the machine stops till the pedal is again depressed.



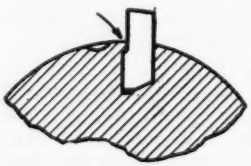
McCrosky "SolAD" Adjustable Reamers.

McCrosky "SolAD" Adjustable Reamer

A new design of adjustable reamer, to be marketed under the trade name of "SolAD," has been developed by the McCrosky Tool Corporation, Meadville, Penna. The reamer is so designed that high speed steel blades are held in slots in an alloy steel body by peening the body metal around the blades. A ground shoulder on the blade, just below the body diameter, allows the peened metal an extra hold on the blade. This shoulder is on the cutting side of the blade; thus the peening process forces each blade against the bottom and back of its slot. The bottom of the blade is beveled crosswise, and the bottom of the slot in the body is milled with a corresponding cross angle so as to give increased strength to the body cross-section and to permit the insertion of the maximum number of blades. This detail of the design permits the production of a sturdy reamer in sizes smaller than have heretofore been considered practical for the inserted blade type.

The slots in the body are milled at a longitudinal angle that rises toward the front end, the bottoms of the blades having a complementary angle. The blades are adjusted forward to compensate for wear and regrinding, adjustment being effected by driving the blades forward with a suitable drift. The cutting edge is always ahead of the center line of the reamer body. The body of the reamer is scored with peripheral lines to assist in adjusting the blades equally. The maximum adjustment ranges from 0.052 in. to 0.131 in., according to size.

Standard machine reamers of the "SolAD" design can be furnished in sizes varying by 1/32 in. from ¾ in. diameter to 1¼ in. diameter, and by 1/16 in. up to 2 in. diameter. Intermediate and decimal sizes can be furnished special to order.

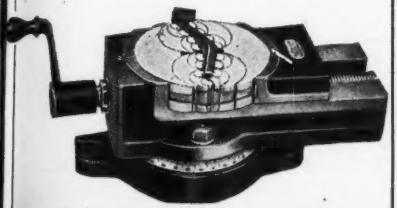


Cross section drawing showing how blade is held in McCrosky "SolAD" reamer by metal peened in at point indicated by arrow.

"Cushmatic" Electrically-Operated Chuck

An electrically-operated, motor-controlled chuck for use on lathes, screw machines, and other similar machines has been developed by The Cushman

YOU OUGHT TO HAVE



A BOSTON Universal Vise

SEE how it grips odd-shaped objects without damage! Just turn the handle and the jaws automatically adjust themselves to hold any odd shaped piece.

Difficult, perplexing work holding problems in the tool room, round-about ways of doing simple jobs, making costly special vise jaws—these problems are solved by the Boston Universal Vise.

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Quick-clamp fixture for boring air compressor cylinders. One of thousands of adaptations.

Most completely engineered.

Greatest variety of standard sizes for selection.

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A. H. PEARSON

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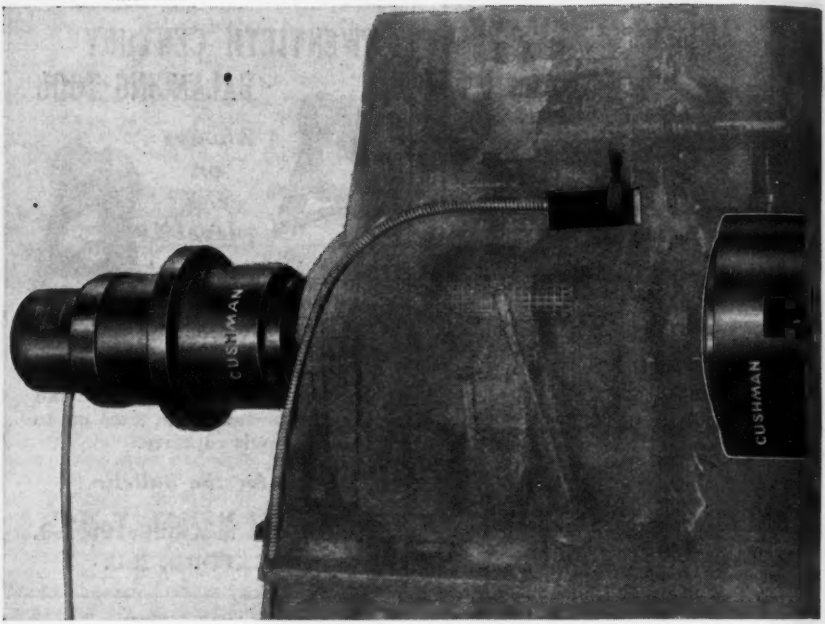

"Cushmatic" Electrically-Operated Chuck as applied to a machine.

Chuck Company, 800 Windsor Street, Hartford, Conn. Power is applied to open or close the jaws of the chuck by the simple movement required to move a lever switch, and a gripping pressure can be applied up to 10 tons. A special rheostat control, however, makes it possible to obtain any amount of flexibility required.

The "Cushmatic" chuck is composed of two separate and distinct parts; a lever-operated chuck with two or more jaws, and a motor with a gear reduction unit. The two units are connected by a draw bar of suitable length, and a control box is so arranged that the pull of the draw bar can be regulated to produce the pressure required. The control box houses reversing switches and, when such is required, rheostat control. The control box is intended to be attached to the wall or other convenient place near or on the machine. The chuck jaws are opened and closed by means of a lever switch on the machine, near the operator's station. Moving the switch in one direction starts the motor, pulling the drawbar and closing the jaws, and moving the switch in the opposite direction reverses the motor, opening the jaws. Electric power is used only during the gripping or releasing movements of the jaws.

The body of the chuck is of steel, rigidly reinforced to overcome distortion. The jaws are of chrome nickel steel, heat treated. Master jaws of standard form are supplied unless otherwise specified. The levers which operate the jaws are of heat-treated chrome nickel steel and are practically unbreakable. The levers are made integral with pins which operate in bushings of hardened tool steel.

The electric motor used to operate the mechanism is 1 h. p., 1750 r.p.m., developing an energy of 3½ h. p. at the instant of maximum pressure of the jaws. The motor is furnished in 3 phase; 110, 220, or 440 volts; 25, 50, or 60 cycle. The gears in the gear reduction unit are of hardened chrome nickel steel, and are noiseless in operation.

All sizes of Cushmatic chucks have been so designed as to give a combined jaw movement of one inch, as this long range is sometimes needed. One and one-half seconds are required for the full jaw movement, the time being reduced correspondingly when a shorter jaw movement will suffice. It is estimated

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That's why so many well-known manufacturers of high grade machine tools, laundry machinery, cranes, rubber working machinery, etc., use the PULLMORE as a standard part of their product.

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ROCKFORD DRILLING MACHINE CO.
10 CATHERINE STREET
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that the chuck can be operated to grip 60 pieces per hour for 8 hours with a total current consumption of one-half a

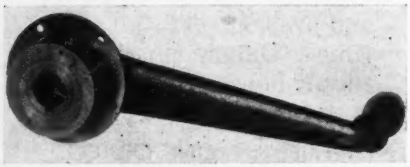
Front view of "Cushmatic" chuck.

kilowatt hour. The chuck is self-centering and is made in 8, 10, 12, 15, 18, 21, and 24-in. sizes, either two or three jaws.

Improved Siewek Fixture Lock

The Siewek Fixture Lock, manufactured by Siewek Tool Co., 10232 Woodward Avenue, Detroit, Michigan, has been improved so that no housing is required in order to adapt it for use. The housing can be cast on the drill fixture or milling fixture, making it possible to bore the housing for the lock and shaft at the same time. The lock can then be applied.

This method of applying the lock in-



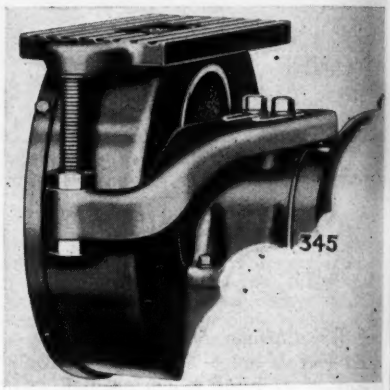
Improved Siewek Fixture Lock.

sures that the lock will be in perfect alignment with the shaft, and eliminates necessity for dowling. The lock is in closer proximity to the work, making a more compact arrangement than has been possible heretofore. An important saving is made in the cost of the lock, as the cost of the housing is eliminated. The housing can, however, be supplied when requested.

"Hisey" Surface Grinding Attachment

The Hisey-Wolf Machine Company, Cincinnati, Ohio, has brought out the surface grinding attachment shown in the illustration. The attachment, as a complete unit, is interchangeable with standard wheel guard equipment, and can be mounted on either the right or left side of the machine.

The table can be adjusted to compensate for the wear of the wheel by means of two heavy square thread screws that are rigidly locked in place by means of two opposed nuts. The guard cover is readily removable for replacement of the wheel. Both the guard and cover



"Hisey" Surface Grinding Attachment

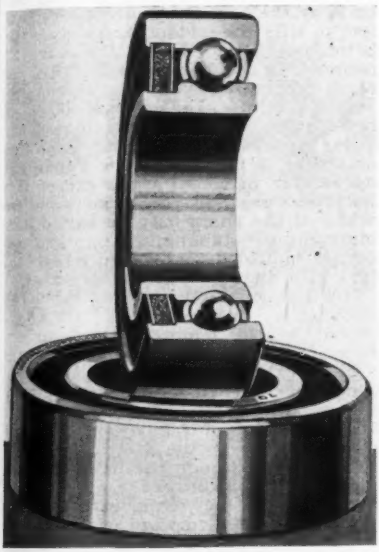
are constructed of steel. The table is of heavy but generous design, 10 x 21 in. in size, and is self-cleaning.

Norma-Hoffmann Self-Protected "Precision" Ball Bearing

In its new "7000" Series of felt-protected closed type ball bearings, the Norma-Hoffmann Bearings Corporation, Stamford, Conn., presents the latest addition to its already extensive line of self-protected precision ball and roller bearings.

The new unit is an all-steel, lubricant - packed, dirt-and-moisture-proof bearing embodying the latest improve-

ments designed to meet the growing trend toward simplification in mounting and lubrication as well as a reduction in the cost of machining and assembling. Wide, solid inner and outer rings provide maximum contact on shaft and in housing, and the design is such that the "7000" bearing can be clamped on both sides. It will carry substantial thrust loads in either direction, in combination with the radial load.



Norma-Hoffmann "7000" Series Precision Ball Bearing.

The "Greaseal" feature consists of a substantial felt washer and a thin fiber ring interposed between split snap rings securely held in a groove in the outer ring. The inner ring is recessed to present a shoulder which, with the felt washer, forms an effective labyrinth as an added safeguard against escape of lubricant. There is ample space for grease, thus reducing the amount of attention needed for proper lubrication. The "700" Precision Ball Bearing is made in a full range of sizes, and interchanges in overall dimensions with all other makes of self-protected bearings.

Hammond Multi-V Belt Grinder

The illustration shows a grinder which has been developed by Hammond Machinery Builders, Kalamazoo, Michigan, for tool, casting, and general purpose grinding. The machine differs from the usual type of electric grinder in that power is transmitted from the motor to the spindle by means of Multi-V belts. The motor is mounted in the rear of the pedestal. The spindle housing is of very small diameter, allowing a maximum of clearance between the grinding wheel and the spindle housing. The machines may be arranged in tandem and operated at different speeds, inas-

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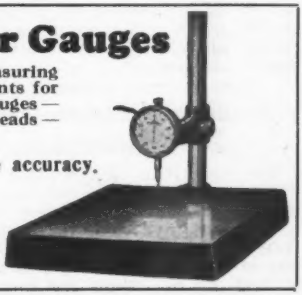


B. C. AMES CO., Waltham, Mass.

Detroit Branch: 902 STEPHENSON BLDG.

Hammond Multi-V Belt Grinder.

much as the speed of the spindle is not limited to the speeds of the alternating current motors. The machine can be supplied with 10, 12, 14, or 16-in. diameter wheels in 1, 2, 3, and 5 h. p. capacities.

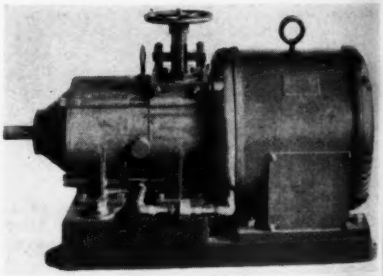
An outstanding feature of the machine consists in that the complete spindle assembly can be removed from the pedestal without disturbing any other mechanical part. This feature is of particular advantage when it is necessary to renew belts. The ball bearings are oversize and run in a bath of oil, where they are protected from dirt and grit by a double labyrinth seal. Universal adjustable wheel guards are standard equipment, as is also an adjustable eye shield of shatterless glass. The motor is totally enclosed, but ventilated through a patented motor air cleaner.

"American" Electro-Hydraulic Transmission

The American Engineering Company, Philadelphia, Penna., announces the introduction of a small, very compact 5 h. p. electro-hydraulic transmission. The transmission will develop full rated torque at any speed, whether it be 1 r.p.m. or 1,000 r.p.m. Since the torque is constant, the horsepower output varies with the speed of the hydraulic motor. At maximum speed the transmission will develop 5 h. p. continuously.

In the illustration the hydraulic motor is at the left, the hydraulic pump is next to it in the middle, and the electric motor is at the right. They are all mounted on a single bed plate reservoir which contains the oil used in the system. The entire transmission, including motor, is only 30 in. long, 14 in. wide and 16 in. high. The hydraulic pump and motor are of the Hele-Shaw design and are similar in construction except that the motor has a fixed stroke while the stroke of the pump may be varied from minimum to maximum. Pump and motor are multi-cylindered and handle the fluid in a smooth, continuous stream.

The electric motor drives the pump shaft at a constant speed. Oil is delivered by the pump to the hydraulic motor at a rate corresponding to the stroke of the pump, regulated by the hand wheel shown, or any other desirable hand or automatic control. This is the only point of regulation, for there are no controls on the electric or hydraulic motors. Through the handwheel the speed of the hydraulic motor can be varied all the way from zero to maximum in either a forward or reverse direction. The pump end of the electric motor shaft is fitted with a fan. Oil in the system passes through finned tubing surrounding the fan, consequently its temperature is maintained at a degree commensurate with efficient operation.

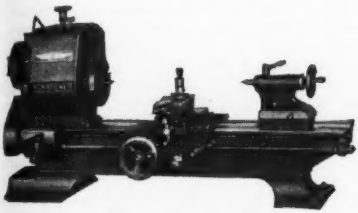


"American" Electro-Hydraulic Transmission

General Radial Drill Models "B" and "C" Lathes

Two new tools intended primarily for manual training service have been

brought out by The General Radial Drill Company, 1769 Elmore Street, Cincinnati, Ohio. These tools are the Model "B" metal working lathe and the Model "C"



General Radial Model "B" Metal-Working Lathe.

speed lathe for wood working. Both machines employ the patented Gibbs V-Disc Transmission, and the general construction of the machines is much the same.

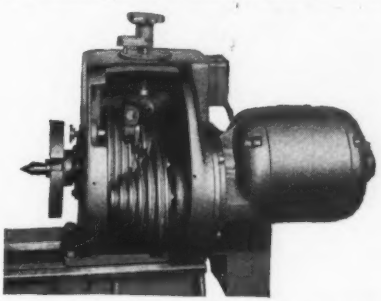
The Model "B" lathe is of 11¼-in. swing, and is made in 4, 5, and 5½-ft. bed lengths, in either bench or floor type. The illustration shows the bench type machine. The head is enclosed. The motor is built in and drives a back cone, this cone in turn driving the spindle cone through a Gibbs Disc, mounted as an idler between the cones. A star knob, mounted on the top of the head, controls the speeds. To change speeds, the knob is lifted until the dowel pin clears the hole, then the knob is turned to the hole that indicates the desired speed.

Model "C" Wood-Working Lathe.

It is impossible for the Gibbs Disc to contact the sheaves, except in perfect alignment for a predetermined speed.

Six spindle speeds are available, from 67 to 580 r.p.m. No moving parts except the spindle are exposed. Every bearing in the head is ball bearing. The spindle runs on angular contact bearings which are easily adjusted for wear. The spindle is made from solid, and has a ⅞-in. hole through its entire length. Forty thread changes are available. The compound may be swiveled to any angle, and the tailstock may be set over for taper work. Standard equipment includes the motor, safety switch, electrical connections, a small faceplate, two centers, tool post complete, thread-chasing dial, wrenches and instruction sheet.

The Model "C" lathe is a speed lathe for pattern or similar wood work. It is of the same general construction as the



Rear view of headstock, showing Gibbs V-Disc Transmission.

Model "B" lathe, excepting that the speeds are much higher. The swing over the bed is 12 in., and it can be supplied with 4, 5, 5½, or 6-ft. bed. The motor, which is of ½ h. p., is built in the head and provides six spindle speeds which may be anything within the usual range. Two standard speed groups are furnished, providing from 400 to 3,400 r.p.m. The Gibbs V-Disc is used, which, in connection with a constant speed motor, makes a most efficient unit. The speed change mechanism is the same as in the Model "B" lathe. Standard equipment includes the motor, switch, electrical connections, 1-in. spur center, ⅝-in. cup center, 3-in. screw chuck, 6-in. faceplate, tool rest holder complete with 6-in. and 12-in. tool rests, and blueprint holder.

Binks Model "2" Thor Spray Gun

The Binks Manufacturing Co., 3130 Carroll Avenue, Chicago, Ill., announces the Thor Model "2" Spray-Painting and Finishing Gun for spraying any material

on any surface. The gun is made in two models, which are identical except that on one the spray adjustment is made by a stationary control and on the other by the use of a removable key. A simple turn of the stationary control screw on the back of the Thor Model "2" Gun

Binks Model "2" Thor Spray Gun.

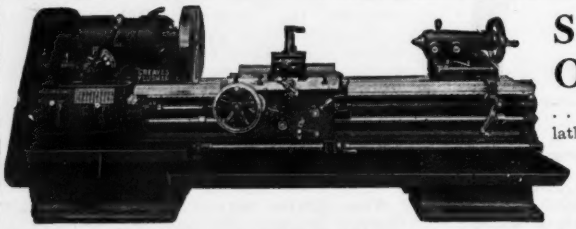
changes the spray from round to fan-shape, or from fan-shape to round, without the necessity of stopping spraying operations or adjusting nozzles.

In plants where it is desirable, the foreman can, with the key-type Thor gun, control spraying uniformity, consumption of material, and quality of finish. The gun is set for the desired spray and the removable key is taken from the gun. It is then impossible for anyone to change the spray without consulting the foreman.

The body of the Thor gun is of drop forged steel having a tensile strength of 62,000 lb. per sq. in. The handle is die cast, the fluid nozzle is of special stainless steel, and the needle valve stem is of special hardened stainless alloy steel. The air nozzle is of drop forged bronze construction. The two-finger trigger is designed for a light, straight pull. The down pull of the material hose at the head is balanced by an air inlet through the handle. Clogging is prevented and accessibility for cleaning is provided by clear passage of the air ports. The Thor air nozzle is self-aligning, requires no adjustment at any time, and the relation of the nozzle to the fluid tip never changes.

"Ball and Roller Bearings"

A book upon ball thrust and radial roller bearings which should serve as a handbook for engineers has just been published by the Aetna Ball Bearing Manufacturing Co. This book, the 9th edition of this company's catalogue, consists of 68 pages. A number of interesting applications of thrust and roller bearings, together with typical mountings for both types of bearings are shown, for carrying unidirectional thrust as well as thrust from two directions. A number of valuable formulas are presented for calculating horsepower, torque, the end thrust of worms and gears, and end thrust of bevel gears, plain, bevel, spiral and hypoids. The complete line of Aetna thrust bearings, retainers and roller bearings are given in condensed form, including their load carrying capacity at various speeds, together with three complete series of roller bearings for light, medium and heavy duty. The book, especially designed for use by designers and draftsmen, measures only 4½ x 7½ in. Copies may be obtained by writing Aetna Ball Bearing Manufacturing Co., 4602 Schubert Avenue, Chicago, Ill.



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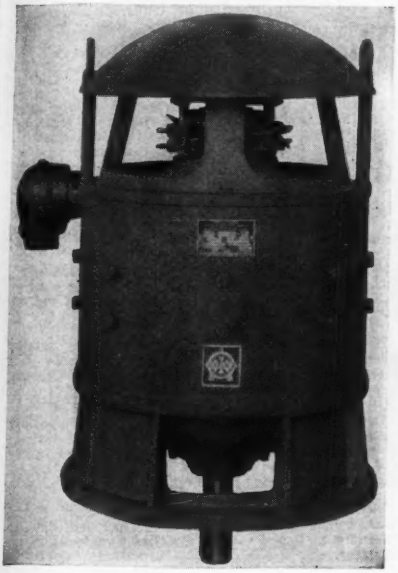
THE GREAVES-KLUSMAN TOOL CO., Cincinnati, O.

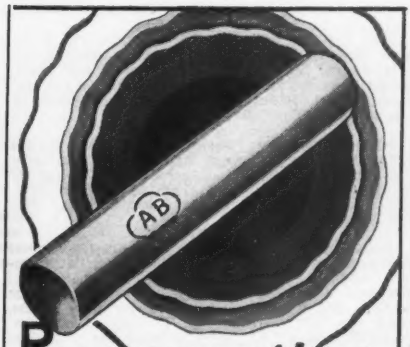
"Reliance" Direct Current Vertical Motor

The illustration shows the Type "T" Direct Current Vertical Motor which has been developed by The Reliance Electric & Engineering Co., 1030 Ivanhoe Road, Cleveland, Ohio. This type of motor is made in a complete range of sizes up to 50 h. p., 1150 r.p.m.



Reliance D. C. Vertical Motor.

The motor is provided with a ring base for mounting, and a drip cover to protect the motor from falling dirt or chips, and dripping water, oil, or other solutions. Where it is desirable, the motor can be mounted direct to the machine that is to be driven without the ring base, in which case the motor appears as an integral part of the machine. Bearings of ample size take the thrust load or weight of the armature. Two heavy eye-bolts are provided to facilitate handling. In all other respects the construction is the same as that of the Reliance Type "T" motor for horizontal operation.



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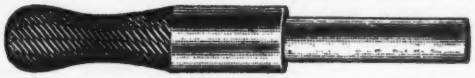

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Selecting Grinding Wheels: The important points to be considered in the selection of grinding wheels for cutter grinding, tool grinding, surface grinding, internal grinding, or snagging are outlined in a series of folders that can be had without charge by addressing Abrasive Company, Tacony and Fraley Streets, Philadelphia, Penna.

Ames Gages: Catalog No. 50, issued by the B. C. Ames Company, Waltham, Mass., contains complete descriptions and illustrations of the dial gages, gage heads, upright gages, cylinder gages, dial micrometers, and precision verifiers, special gages and attachments made by this company. Copy free upon request.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine Co., 200 Davis Ave., Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Hold Odd-Shaped Pieces Securely: A vise in which odd-shaped work can be held securely without the need of special jaws or fixtures is described in a folder that has been issued by The Avey Drilling Machine Co., P. O. Box 487, Cincinnati, Ohio. Copy free upon request.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-oiling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Groenerd Arbor Presses: Catalog No. 36, issued by the Edwin E. Bartlett Co., Nashua, N. H., describes and illustrates all the various types and sizes of arbor presses made by this firm. Copy free upon request.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

Mark Tools or Parts: Metals are easily marked by the Etchograph—an electrical unit that can be used with any light circuit. For particulars address William Brewster Company, 52 Church St., New York, N. Y.

Sheet Metal Problems: The use of the nibbling machine for cutting sheet metal stock is discussed in a booklet which can be had without charge by addressing Andrew C. Campbell, Inc., Bridgeport, Conn.

Mounted Grinding Wheels for use in small holes such as are found in bushings, dies, gears, tools, etc., are described in a catalog that has been issued by the Chicago Wheel & Manfg. Co., 110 S. Aberdeen St., Chicago, Ill. Copy free upon request.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

Motorize Your Cone Pulley Lathes: An attachment that can be applied to your lathe with four bolts makes it possible to motorize and modernize your lathes. Write for information to Cullman Wheel Co., 1336 Altgeld St., Chicago, Ill.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Precision Grinding: A booklet which describes and illustrates the most modern methods of performing all kinds of precision grinding operations, showing how the Dumore grinder can be applied to various kinds of machine tools, has been published by The Dumore Company, Racine, Wis. Copy free upon request.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Check For Information Wanted

If you are interested in prices or information on any of the equipment listed, check the item, write your name, firm name, title and address on the margin, tear out the page and send it to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. We will see that you are supplied with the information desired.

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- ☐ Gears, Cast or Cut
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- ☐ Grinding Machines, Internal
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- ☐ Grinding Machines, Surface
- ☐ Grinding Wheels
- ☐ Grinding Wheel Stands
- ☐ Hammers, Pneumatic
- ☐ Hobbing Machines
- ☐ Hobs, Gear
- ☐ Hoists, Chain or Electric
- ☐ Indicators, Speed or Test
- ☐ Jacks, Planer
- ☐ Keyseating Machinery
- ☐ Lapping Machines
- ☐ Lathes, Engine
- ☐ Lathes, Turret
- ☐ Lathes, Automatic
- ☐ Lathes, Bench
- ☐ Lathes, Gap
- ☐ Lathes, Polishing
- ☐ Lathe Dogs
- ☐ Lubricants
- ☐ Mandrels, Expanding
- ☐ Mandrels, Solid
- ☐ Micrometers
- ☐ Milling Machines, Automatic
- ☐ Milling Machines, Bench
- ☐ Milling Machines, Horizontal
- ☐ Milling Machines, Vertical
- ☐ Milling Attachments
- ☐ Milling Tools
- ☐ Oil-Grooving Machines
- ☐ Oil Stones
- ☐ Oils
- ☐ Ovens, Industrial
- ☐ Parallels
- ☐ Pipe-Cut'g & Th'd'g Mach'y
- ☐ Pipe Tools
- ☐ Planers
- ☐ Polishing & Buffing Machs.
- ☐ Presses, Arbor
- ☐ Presses, Punch
- ☐ Pulleys, Metal or Wood
- ☐ Pumps, Lubricant or Oil
- ☐ Punches, Hand
- ☐ Punches, Power
- ☐ Punch Holders
- ☐ Racks, Cut
- ☐ Reamer Holders
- ☐ Reamers, Adjustable
- ☐ Reamers, Solid
- ☐ Riveting Machines
- ☐ Rules, Steel and Wood
- ☐ Rust Preventatives
- ☐ Saws, Metal
- ☐ Saw Frames and Blades
- ☐ Sawing Machines, Power
- ☐ Saws, Band
- ☐ Saws, Milling
- ☐ Scales, Machinists'
- ☐ Screw Machines, Automatic
- ☐ Screw Machines, Hand
- ☐ Screws, Cap, Set or Mach.
- ☐ Screws, Hardened Drive
- ☐ Screws, Self-Tapping
- ☐ Shafting
- ☐ Shafts, Flexible
- ☐ Shapers
- ☐ Shears, Hand or Power
- ☐ Sleeves, Drill
- ☐ Springs, Pressure Pad
- ☐ Squares
- ☐ Stamps, Steel
- ☐ Stands, Shop, Portable
- ☐ Tap Holders
- ☐ Tapes, Measuring
- ☐ Tapping Machines
- ☐ Tapping Attachments
- ☐ Taps and Dies
- ☐ Taps, Collapsible
- ☐ Testing Mach'y, Hardness
- ☐ Thread-Cutting Tools
- ☐ Threading Machines
- ☐ Thread Mill. & Roll. Mach'y
- ☐ Tool Bits
- ☐ Tool Cases
- ☐ Tool Holders
- ☐ Tool Posts, Lathe
- ☐ Trolleys and Tramways
- ☐ Trucks, Hand, Lift, Power
- ☐ Turrets, Tool Post
- ☐ Valves, Air Control
- ☐ Vises, Bench or Machine
- ☐ Welding Equip. & Supplies
- ☐ Welding Machines, Electric
- ☐ Wrenches, Drop-Forged
- ☐ Wrenches, Pipe
- ☐ Wrenches, Ratchet
- ☐ Wrenches, Tap

Lathe Turrets of eight different types and twelve sizes are described and illustrated in Circular No. 18, issued by Fay & Scott, Dexter, Maine. Copies free upon request.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

The Involute Gear Simply Explained: A direct, clear explanation of the theory and principles of involute gearing without the use of higher mathematics can be obtained without charge by addressing The Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Tungsten-Carbide Tipped Tools: The boring tools, counterbores, form cutters, facing heads, reamers, spotfacers, and other tools made by The Gairing Tool Co., 1629 West Lafayette Blvd., Detroit, Mich., made with or without tungsten-carbide tips, are described and illustrated in Catalog No. 20. Copy free upon request.

Take Care of Your Tools by keeping them in a convenient, strong, and fine-looking chest. A catalog of tool chests, complete with descriptions and illustrations, can be had by addressing H. Gerstner & Sons, 1283 Columbia Street, Dayton, Ohio.

Machine Vises of all sizes for use with machine shop equipment are described in a circular that will be sent free upon application to The Graham Mfg. Co., 69 Willard Ave., Providence, R. I.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Swiss Files: The complete line of Grobet Swiss Files for use in die and tool work or for other fine work is described and illustrated in Catalog "K," published by the Grobet File Corporation of America, 3 Park Place, New York, N. Y. Copy free upon request.

Drawing Tables: The Hamilton steel-base, adjustable drawing table is described in Catalog No. 7-MS, issued by the Hamilton Mfg. Co., Two Rivers, Wis. Copy free upon request.

Grinding, Polishing and Buffing Machines of the latest types are described and illustrated in a series of bulletins that have been issued by the Hammond Machinery Builders, Kalamazoo, Mich. Copies free upon request.

Texdrive Grinders for Vitrified or High Speed Wheels: A six-page bulletin No. 43 describes in detail and illustrates the advantages of the new Hisey Texdrive Grinder —stressing especially the multi-speed and single-speed machines. Write for a copy to The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, O.

Precision Bench Lathe Work can only be done on finely-built, accurate machines. The complete line of Hjorth Precision Bench Lathes is described and illustrated in a catalog that has been issued by Hjorth Lathe & Tool Company, 24 School Street, Boston, Mass. Copy free upon request.

Useful Tool Information: The Illinois Tool Works, 2503 N. Keeler Ave., Chicago, has published a catalog which describes and illustrates the standard and special cutters, mills, hobs, gear cutters, thread cutters, saws, reamers, and other tools made by this firm. The book also contains a number of useful tables and formulas. Copy free upon request.

Keller Automatic Toolroom Machine for machining dies, metal patterns, jigs, core boxes, molds, and other irregular parts is fully described in a booklet that can be had free by addressing the Keller Mechanical Engineering Corp., 84 Front Street, Brooklyn, N. Y.

Threading Machinery: Catalog No. 32, containing full descriptions of Landis threading machines, stay bolt threading machines, bolt factory threading machines, automatic forming and threading machines and chaser grinders can be had without charge by addressing Landis Machine Co., Inc., Waynesboro, Penna.

Flexibility in Cylindrical Grinding means increased production, need for less equipment, and lower costs. Send for information as to the advantages of Landis Hydraulic Grinders. Address Landis Tool Co., Waynesboro, Penna.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

M-C Pinion Rod, made by the Meisselbach-Catucci Mfg. Co., 70 Stanton St., Newark, N. J., insures economy and accuracy in cut pinions. Send for information.

Installation and Maintenance of Lathes: A newly compiled booklet showing proper methods of installing, leveling and maintaining Monarch Lathes. It is useful information for every lathe user. Mailed free. Address The Monarch Machine Tool Company, Sidney, Ohio.

Compound Spot-Facing Tool: A spot-facing tool retracting, serrated roughing cutters and fixed finishing cutters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Mummert-Dixon Co., 120 Philadelphia St., Hanover, Penna.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co., Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Noiseless Gears: Full details concerning a service for the accurate cutting and finishing of gears, practically eliminating noise, can be had by addressing National Broach & Machine Co., Shoemaker and St. Jean, Detroit, Michigan.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

"Commercial Lapping for Close Limits and High Production" is the title of a booklet that discusses hand and machine lapping, types of lapping tools and machines, workholders for machines, preparation of laps, preparation of work for lapping and other important points. A copy may be had by addressing Norton Company, Worcester, Mass.

A good one for your Driller, Miller, Shaper or Planer.

VISE

Jaws 6", 9" and 12" Long
V-Jaws, extra, for All

Fig. 2. Without Attachments

With and Without Jig Attachments

Any vise will pay. More time is consumed in catching work than drilling it.

Send for Circulars

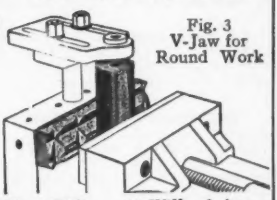


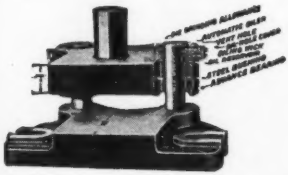
Fig. 3 V-Jaw for Round Work

THE GRAHAM MFG. CO., 69 Willard Ave. Providence, R.I.

BAUMBACH

Automatically Oiled

DIE SETS



Standardized die sets, embodying many exclusive features, and a listing of 70,000 stock sizes afford a service that is unsurpassed.

Your Inquiries Solicited
Send for New 120 Page Catalog

E. A. Baumbach Mfg. Co.
1806 S. Kilbourne Ave. Chicago, Ill.

Anderson Improved

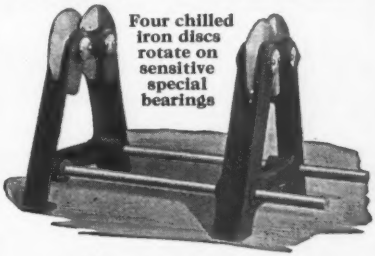
Balancing Ways

No Leveling Required

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



Four chilled iron discs rotate on sensitive special bearings

Write For Full Information

Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee Street, Rockford, Ill.

The Ideal Speed Lathe

(PATENT APPLIED FOR)

FOR lapping-finishing-polishing of small parts —bushings, handles, wire dies, etc. Totally inclosed ½ H. P. motor, with two speeds, 900-1800 or 1700-3400 R.P.M. Automatic brake—Universal or Collet Chuck—Hole throughout length of spindle.

Write for "IDEAL" Speed Lathe Bulletin.

THE SCHAUER MACHINE CO., 905 Broadway, Cincinnati, Ohio
MFRS. OF ELECTRIC TOOLS SINCE 1907

"Fastenings" is the title of a booklet, issued by the Parker-Kalon Corporation, 192-196 Varick Street, New York, N. Y., in which are included the results of surveys made in fourteen different plants as to the efficiency of fastening methods. Copy free upon request.

Q-C Standardized Fixture Units in 677 sizes and 5 styles are described and illustrated in the Engineering Book put out by A. H. Pearson, 7 E. Grand Ave., Detroit, Mich. Copy free upon request.

"Most Frequent Mistakes Made in Hardening:" Users of steel can obtain a wall-chart on which are listed the most common mistakes made in hardening tool steels, results of mistakes as shown on the tools, appearance of fracture, and suggestions for remedying the mistakes, by writing to the Poldi Steel Corporation of America, 247 West 18th Street, New York, N. Y.

Shape or Slot With This Machine: The Rhodes Convertible Shaper, made by The Rhodes Manfg. Co., Waltham, Mass., can be used for horizontal shaping or vertical slotting. Details upon request.

Bench Lathe Mounting and Driving Equipment: Bulletin 120-A, issued by Rivett Lathe and Grinder Corporation, Brighton, Mass., contains complete descriptions and illustrations of modern and conventional countershaft, individual motor drive jackshaft, and speed box motor drive, also benches, cabinets, oil pans, etc. Copy free upon request.

Fulmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Stamp Blanks in Small Lots: Sheet metal blanks of any size or shape can be made by a special process and at low cost, eliminating time and cost of making die. For details, address Dayton-Rogers Manfg. Co., 1112 South Third Street, Minneapolis, Minn.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Electric Tools: The complete line of "Ideal" electric drills, screwdrivers, nut setters, and grinders of various types is described and illustrated in Catalog No. 30, issued by The Schauer Machine Co., 907 Broadway, Cincinnati, Ohio. Copy free upon request.

Stamp Your Name on Your Product: Full information as to the steel roller dies made by The Schwerdtle Stamp Co., 10 Cannon Street, Bridgeport, Conn., can be obtained by writing this firm.

Economies in Material Handling: A volume of facts about planned load handling, with actual examples of economies in time, material, and labor costs that have been effected with Shepard electric hoists will be sent free upon request to Shepard-Niles Crane & Hoist Corp., 424 Schuyler Avenue, Montour Falls, N. Y.

Rapid Drill Jigs: How time can be saved and drilling operations made easier by the use of a quick-acting drill jig is told in a booklet that is issued free by the Siewek Tool & Die Co., 10230 Woodward Ave., Detroit, Michigan.

Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

The Most Efficient Speed for the operation of special production units, power conveyors, and other machinery by the use of the WHS Speed Reducer and how it can be obtained is told in a bulletin that will be mailed free by Winfield H. Smith, Inc., 30 Eaton St., Springville, N. Y.

Speed and Accuracy in Straightening: The Springfield Straightening Press is an ideal tool for use in straightening any length or size of rough or finished work. Send for illustrated folder. Address The Springfield Machine Tool Co., 630 West Southern Avenue, Springfield, Ohio.

Stackbins Save Space: Bins which may be used as individual containers, as tote-boxes, or "nested" to form stock-room sections are described in an illustrated circular published by the Stackbin Corporation, Pearl and Rice Streets, Providence, R. I.

Rigidmilling Principles and Practice: A book that shows how the rigidmill can be adapted to various kinds of usual and unusual milling operations, and which describes in detail the work that can be handled by this machine has been issued by the Sundstrand Machine Tool Co., Rockford, Ill. Copy free upon request.

Save Cutting Oil: How cutting oil can be separated from chips and thus reclaimed by the use of a centrifugal chip "wringer," is told in a bulletin that is issued free by the Tolhurst Machine Works, Troy, N. Y.

Penetrating Oil for High-Speed Equipment: Three-In-One Oil, blended scientifically from animal, mineral and vegetable oils, will penetrate the tightest bearings and lubricate high speed units perfectly. Full information can be had by writing Three-In-One Oil Co., Dept. 96, 130 William St., New York, N. Y.

Chuck With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

Change drilling speeds instantly without stopping the machine or touching a belt. This can be done with the Victor Super-Drill, made by U. S. Automatic Box Machinery Co., Newtonville, Boston, Mass. Bulletin free upon request.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 29, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Wappat "Red Streak" H. D. Electric Drills that cannot be stalled by any hand drilling test are fully described and illustrated in a catalog that can be had by addressing Wappat, Incorporated, 7522 Meade Street, Pittsburgh, Penna.

Wrenches For Every Use: "Guaranteed Against Breakage" tappet wrenches, pipe and fitting tongs, offset wrenches, and wrenches for all other uses are described and illustrated in a series of folders which can be obtained without charge by addressing J. H. Williams & Co., Buffalo, N. Y.

GOOD NEWS FOR TRAVELERS

ROOM RATES AT ALL 23 UNITED HOTELS have been reduced 10% to 30%

"The Roast Chicken is Very Good Sir"

. . . in fact, Hotel Fort Shelby is proud of its entire menu. Its four restaurants offer the ultimate in service . . . and your choice of a variety of tempting and delicious dishes at surprisingly, reasonable prices. ¶ Hotel Fort Shelby's preferred location . . . beautiful, commodious rooms . . . inviting lobby and reasonable rates contribute, also, to its popularity. ¶ 900 units . . . all with servidor, private bath and circulating ice water. Rooms as low as $3.00 per day . . . suites $10.00 and upwards.

Motorists are relieved of their automobiles at the door without service charge. Write for free road map, and your copy of "Aglow with Friendliness," our unique and fascinating magazine.

HOTEL Fort Shelby

E. J. BRADWELL, *Manager*

DETROIT

"AGLOW WITH FRIENDLINESS"

By GEO. ALEXANDER MANN

You've Been There

"Are the fish bitin'?"
"I don't know, brother—
Wouldst say if they are,
They're bitin' each other."

Depressions are tuff when wimmin have to go on and on with the same ol' automobiles an' husbands.

'Bout the only time the average woman shows any respect for the spirit o' economy is when she's placing the candles on her birthday cake.

Some Testimonial

"Your medicine is great,"
Writes Mrs. McGann,
"I couldn't spank baby,
"Now I lick the old man."

You're one o' the herd or you're missin' a lot o' fun.

Did they say prosperity wuz aroun' the "corner" or aroun' the "coroner?"

Why, Archie

"Divorces cost more
Than weddings," said Orr,
"Yeh," said Archibald,
"They're worth so much more."

'Twould seem that the Democrats have made up their minds to have harmony if they have to knock the heck outa each other to get it.

Wimmin may not believe everything they hear, but that don't keep 'em from repeating it.

A Hot Finish

"How's grandpaw stand the heat?"
Was asked by Martha Meek.
Johnny said, "I do not know,
He's only dead a week."

Ain't Ut Hull?

Yeh. The depression is turrible. So many of us have had to go back to our one automobile.

Turrible

Madge and her car
Hit a water trough,
'Tis said that both
Had their paint knocked off.

People who're always askin' questions develop their own penalty. They gotta listen to answers as dumb as the questions.

Some Record

They are an ideal couple,
Mr. and Mrs. Lott,
They've lived ten years together,
And neither've fired a shot.

They're Well Fixed With Essentials

They say they're goin' to refinish City Hall inside and out. Yeh. Let 'em use chalk on the outside an' paper the inside with two-dollar bills.